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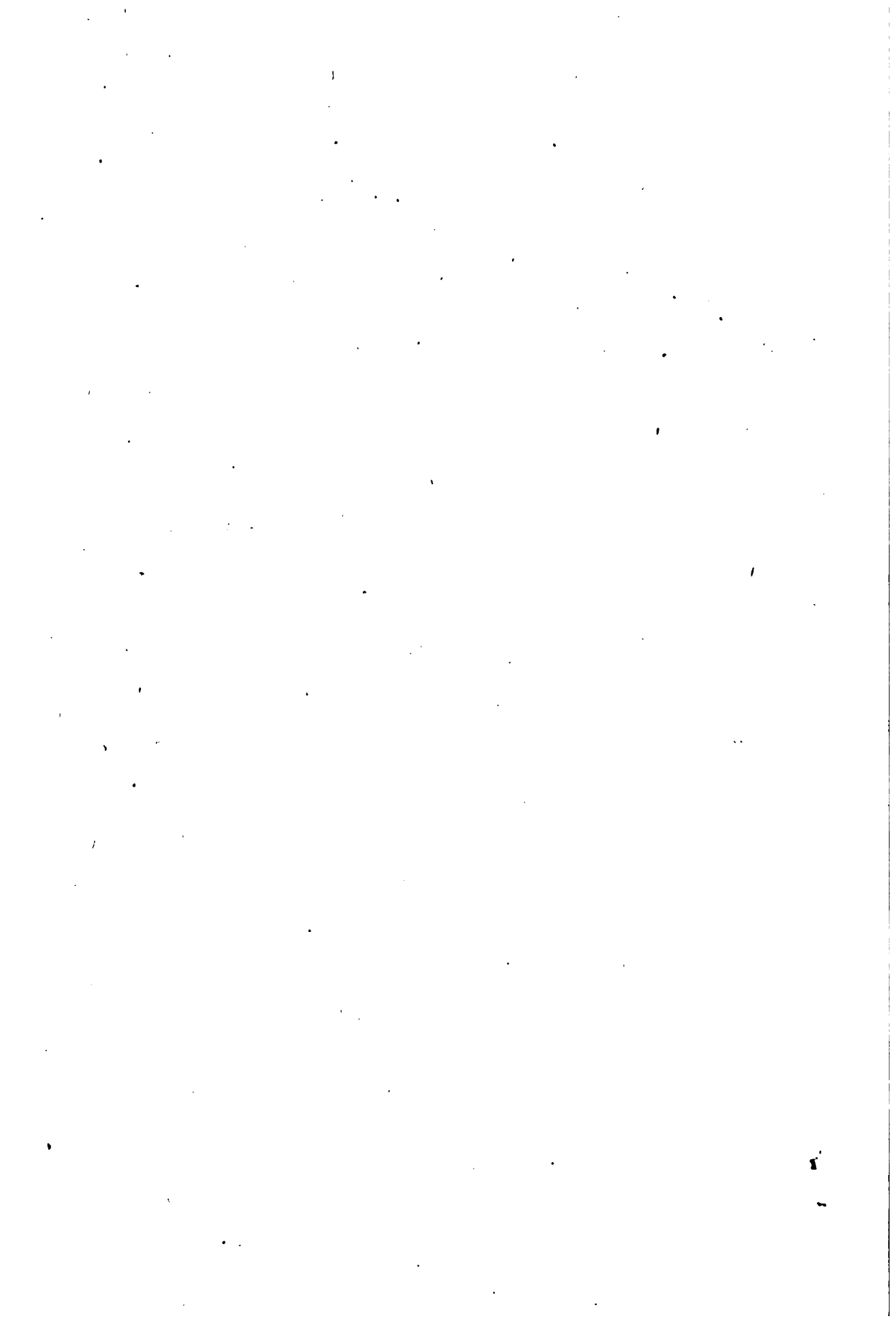
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The  
International Journal  
OF 18031  
ORTHODONTIA  
AND  
ORAL SURGERY

MARTIN DEWEY, D.D.S., M.D.  
Editor-in-Chief

VOLUME V  
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# The International Journal of Orthodontia

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## ORIGINAL ARTICLES

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### WHAT ORTHODONTIA AND ORTHODONTISTS HAVE TO OFFER TO OUR OWN, AS WELL AS TO ALLIED, SCIENCE\*

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BY BERNHARD WOLF WEINBERGER, D.D.S., NEW YORK CITY

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"OBSERVE, COMPARE, REFLECT, RECORD"

WHAT I have to offer the American Society of Orthodontists today I know is far different in character than my two preceding papers; nevertheless, there are many factors previously described that again make their appearance, but this time in an entirely different form. In describing cases I have taken those found in one orthodontic practice that have not only proved instructive in orthodontia, but have become valuable material for allied sciences. At the same time this paper will introduce a new procedure, heretofore for some unknown reason overlooked in this association; nevertheless the like is considered a yearly contribution and a practice in many scientific societies, and I trust in the future will be the regular procedure at our sessions.

Orthodontia became a recognized science only after it outgrew the care and strength of the parent "Dentistry." Since leaving what was the adopted home, the child now has developed in stature beyond that of its ancestors and seeks its support, nourishment, and vitality in those branches of science that permit her further growth and life. Orthodontia wants and will take all that such sciences as anthropology, biology, embryology, comparative anatomy, psychology, etc., can give. Orthodontia today is a study of many and varied scientific subjects, and in order to accomplish our mission and purpose we

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\*Read before the Eighteenth Annual Meeting of the American Society of Orthodontists, Chicago, Ill., August 1-3, 1918.



have asked those in the above sciences to cooperate with us; we have brought their men to our meetings to give their knowledge in papers on any number of subjects and they in turn have asked for like assistance and cooperation from us, but so far that which we pledged ourselves many times to do, remains undone.

My purpose, therefore, is to present a few cases that I find have interested associate coworkers, and at the same time will, I trust, add additional knowledge to orthodontia. All have undoubtedly similar, in fact, perhaps more interesting cases in your respective practices; I trust for the sake of some men who desire this information that you will in the future record them.

To the anthropologist, biologist, as well as comparative anatomist, supernumerary teeth as found in our orthodontic collections seem to concern them the most; although I find each branch of science looks upon this phenomenon of nature from an entirely different viewpoint, they still all come to the same conclusion. Therefore let me at the outset consider a few of these cases. The biologist considers this deviation a question or a problem in heredity or nonheredity, while the anthropologist and comparative anatomist not only of heredity but one of reversion or atavism.



Fig. 1.

Fig. 2.

Fig. 1.—Occlusal view showing supernumerary left in place of the permanent lateral. The permanent lateral erupting within the dental arch, (brother) age 13.

Fig. 2.—Similar condition found in another member of the family, but in this case erupting on the right side, (sister) age 15.

#### SUPERNUMERARY TEETH

The first case that will be reported is a type I know from experience interests all of our scientific brethren. Figs. 1 and 2 are from brother and sister, age thirteen and fifteen respectively, each having a supernumerary lateral placed almost identically within the dental arch, although on opposite sides, causing the permanent laterals to erupt on the palatal surface. The fact immediately enters our mind that here is a condition that is analogous in two members of one family; but of greater importance to us as orthodontists, is a question that I do not believe has been previously considered. Why do supernumeraries erupt first? That this they do in nearly all cases if we examine our models, is certain, otherwise the permanent teeth would be found in their regular and not in some foreign position. Finding as we do in these two particular cases



Fig. 3.—Extracted supernumerary teeth, the one on the left Fig. 1, on the right Fig. 2.



Fig. 4.—A case showing a supernumerary right upper incisor.



Fig. 5.—The impacted central and canine in the case shown in Fig. 4, after the supernumerary had been extracted the bony wall was removed.



Fig. 6.—Front and side view, supernumerary tooth, illustrates twist of the crown on the root, and shape of tooth.



Fig. 7-A.—The impacted tooth restored as nearly as possible to its proper position and its relation to the supernumerary.



Fig. 7-B.—Photograph of previous case showing the position of the impacted central and canine.

conditions that are so similar, the question of heredity enters into immediate consideration. This is a problem we as orthodontists can not solve, but we all know how often parents inquire and desire an answer.

Supernumeraries that are similar to these are numerous, but all are not as easy to be determined from the permanent tooth as in this case. Here radiograms showed that the tooth within the dental arch had the shorter root, while the crowns proved to be smaller in diameter as well as being more irregular in shape. This can be seen in Fig. 3, a photograph of the two extracted teeth.

The next case, another containing a supernumerary tooth, might merely represent an addition in number to our friends; to us it presents a more complex problem and is shown in Fig. 4. Here again we find that this tooth has erupted first, causing the peculiar impaction of the upper right central incisors and cuspid as seen in Fig. 5. Here again we are forced to ask the question: Why has this tooth assumed its peculiar twist and shape, as well as preventing the above described teeth from erupting? (Fig. 6.)



Fig. 8.

Fig. 8.—Illustrates a perfect alignment of teeth in the lower arch, although five anterior incisors are present.



Fig. 9.

Fig. 9.—Upper and lower dental arches in occlusion. Although there are five lower incisors, nature has compensated in the upper by increasing the diameter of the teeth.

The answer to this question is more easily seen by referring to Fig. 7 which shows the impacted tooth, as nearly as possible, restored to its former position. All can readily see where the pressure has been applied as well as the effect it has had on the formation of the root of the supernumerary tooth. The deciduous tooth being in its normal position while the crown of this tooth was forming has undoubtedly caused it to assume this form. Has the position of the supernumerary between the deciduous and the germs, later the crowns, of the permanent teeth any particular bearing upon the peculiar formations of these teeth, and to what extent do they cause impactions? The example, I believe, is ample evidence that we must pay closer attention in orthodontic cases to supernumerary teeth, as to the results they have on dentition, on the formation of crowns and roots as well as on impacted or missing teeth, a further study will prove beneficial.

CASE III. Supernumeraries upon erupting do sometimes fall within the dental arch line without causing a disturbance or irregularity of the teeth. Nature, broadly speaking, in her wisdom undoubtedly provided for such contingencies, as shown in Fig. 8. We here find five lower incisors all the same shape, size, and regularity of form, while the radiograms show the roots of each to be of equal length. Seldom have I seen as perfect an alignment even when the normal number are present. Fig. 9 illustrates the upper and lower dental arches in occlusion, (the right side is almost identical), except for a slight



Fig. 10.—Similar condition showing five lower incisors. (Army Medical Museum, Washington.)



Fig. 11.—Side view of Fig. 10 illustrating a perfect occlusion, although having five lower incisors. See Fig. 10. (Army Medical Museum, Washington.)

overbite the occlusion is perfect. I doubt if any of you would care to extract a tooth to reduce the size of this mandible. Has the arch been compensated by increasing the tooth substance in the upper to take care of the increase of the extra tooth in the lower, or has the amount of tooth substance in the other lower teeth been reduced to bring about occlusion? In this case it looks very much as though it did undoubtedly follow one or the other of these procedures. This is a question that has often been raised at these meetings, but so far remains unanswered.

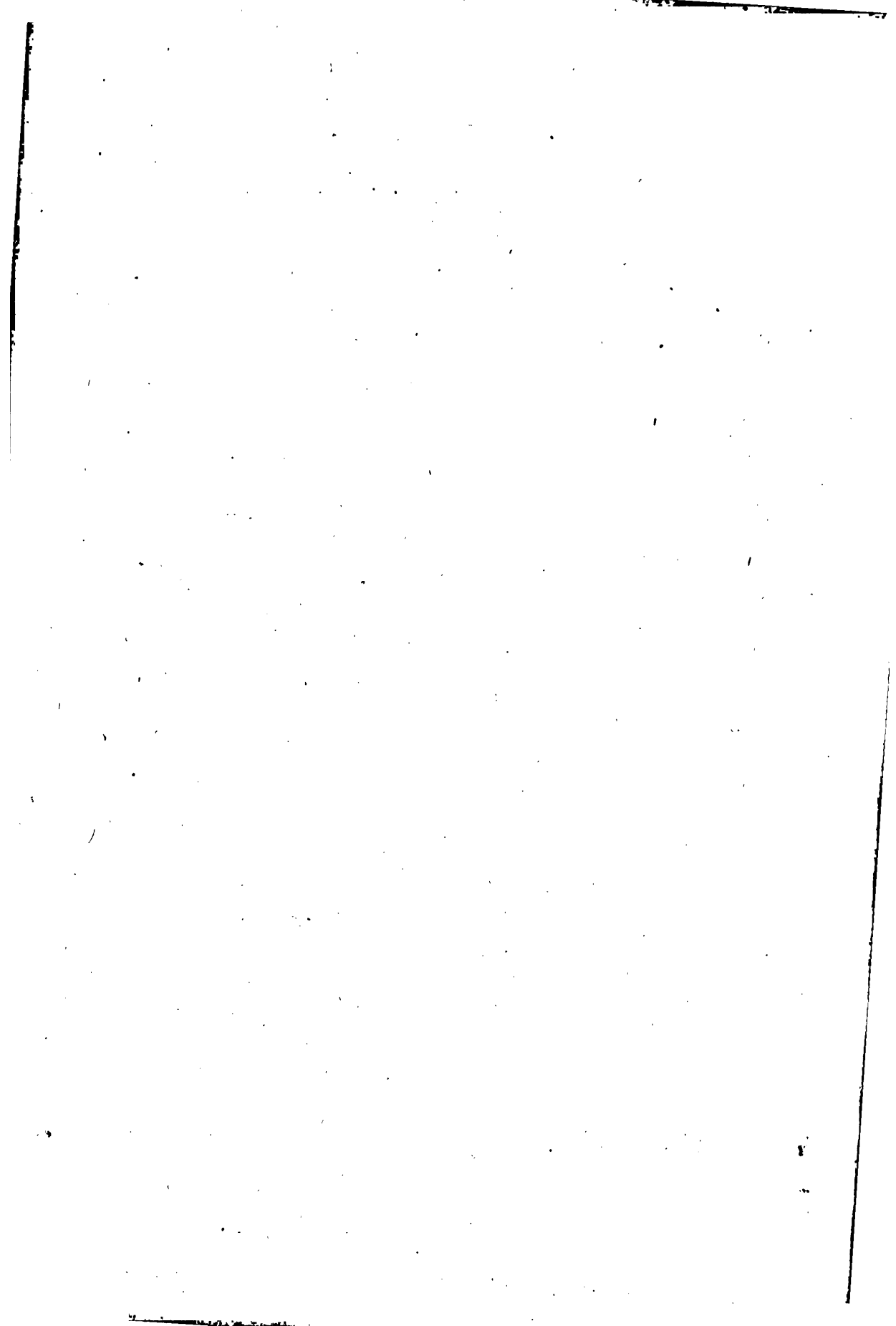




Fig. 16.—Represents an extreme type of missing teeth, age 26. Missing upper laterals, premolars, second and third molars, deciduous second molars still in position. In the lower, central, premolars, second and third molars are missing.

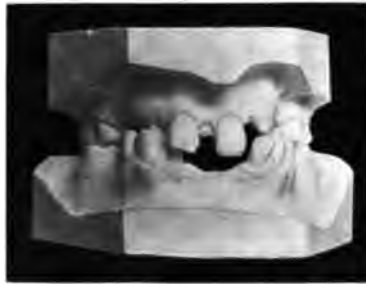


Fig. 17.—The front view showing occlusion.



Fig. 18.—Another case of missing teeth, both upper first and second premolars missing.



Fig. 19.—The lower, with lower second premolars missing.



Fig. 20.—Upper second premolars missing.



Fig. 21.—Upper second premolars missing.

in which the question involves whether we are justified in opening the spaces between the premolars and molars on the left side and inserting a tooth, while on the right side bringing the premolar into its normal position, or whether we are permitted to extract this tooth. The brother, being the older and lacking a tooth, I often wondered whether nature tried to compensate in the sister that which she neglected in the brother by the addition of the tooth.

#### MISSING TEETH

Missing teeth are another problem that is of extreme interest to our friends. I need not tell this assembly the problems and tribulations that they bring to us. Fig. 16 represents an extreme case of this type of missing upper lateral, premolars and all molars with the exception of the first permanent ones. In the lower, centrals, premolars and second and third molars are missing. The radiograms fail to locate germs or teeth. The dental arches are shortened, with the lack of alveolar process due to noneruption of teeth. No negative ancestral history in the family has been found so far as can be determined. Fig. 17 shows the teeth in articulation.

Another case not as extreme is shown in Fig. 18. Here the upper premolar and the lower second premolars are missing. Fig. 19 shows peg laterals in upper and diminutive ones in lower. Another sister in the family presents a similar condition, still both parents have the normal number of teeth. The third generation, the ones that would prove the most interesting in this case, I can find out very little about.

In Fig. 20 we find both the uppers; in Fig. 21 the lower left premolars are missing.

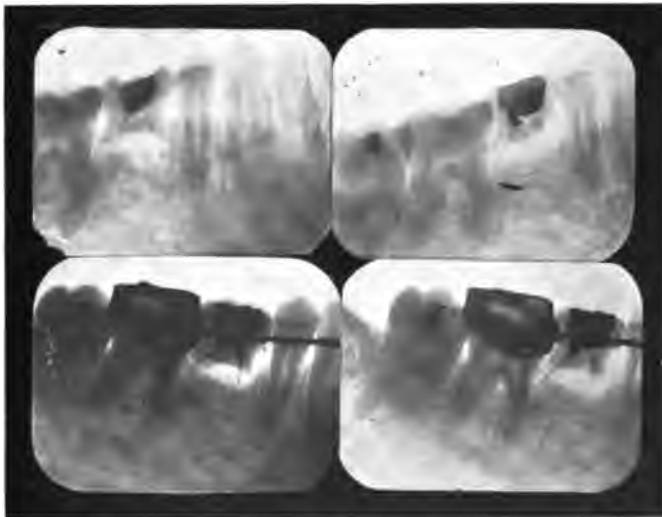
Fig. 22, A and B is a slide showing radiograms of the lower left second deciduous molar each taken approximately a year apart, and is of interest to our friends the pathologists, in so far as it illustrates how roots of teeth absorb without the presence of the tooth that takes its place. This tooth has now been lost.

Pyorrhea is another problem of interest. Fig. 23 shows a condition present at twelve, although it had existed for at least four or five years prior. The upper permanent central and incisors, with the four lower incisor teeth are loosened and ready to drop out of their sockets. Occasionally we find cases as early as this age, and the etiology must be more than the malposition of the teeth.

In connection with missing teeth, there are two more cases I desire to record not so much as to the nonpresence of teeth but on account of the peculiar condition often associated with them, and also as in this case, the similarity of conditions in various members of the family. Figs. 24, 25, and 26 are of two sisters with upper missing laterals, a third sister also lacks these teeth. No third molars have erupted or are to be found. In Fig. 27 we find not only the presence of the lower left deciduous cuspid, but the permanent one as well. This is a condition we are apt to find in this type of case as well as sometimes the entire absence of the permanent cuspid.



**Fig. 22-A.**—Radiogram of Figs. 20 and 21 with left lower deciduous second molar in place, showing no permanent tooth to take its place.



**Fig. 22-B.**—Series of radiograms showing absorption of the roots of the second deciduous molar, no permanent tooth to take its place.



## INTERNAL SECRETION

Wherever we have the presence of both the deciduous and permanent teeth, or the nonpresence of the tooth, we have without question the problem of internal secretion to contend with. This question leads us to one of the most complicated factors in orthodontia, the one we know so little about and



Fig. 23.—Child of twelve showing the loss of upper anterior teeth due to the so-called pyorrhea condition.



Fig. 24.—Upper case of missing teeth.



Fig. 25.—Lower case of missing teeth, germs having never formed.



Fig. 26.—Upper showing a similar condition.



Fig. 27.—Lower showing a similar condition as found in the sister, Figs. 24 and 25. In Fig. 27 is found not only lower left deciduous cuspid, but the permanent as well.

are beginning to find so often in our practices. It is a problem we must leave to our medical coworkers to solve, until we ask them to aid us in this work the etiology of our cases in orthodontia will remain obscure. We as ortho-

dentists can and must call their attention to this type of case and seek their cooperation early enough to prevent in the patient the more complicated conditions such as goiters, etc., from arising.

The next figures are two of six I showed last year, calling your attention to the importance of observing spacings between the posterior teeth, Figs.



Fig. 28.—Overdevelopment of the maxilla and mandible and marked spaces between the cuspid, premolar, and molar.



Fig. 29.—Similar to Fig. 28, the spacing between all of the teeth.



Figs. 30 and 31.—Overdevelopment of the maxilla and mandible associated with thyroidism.

28 and 29, while Figs. 30 and 31, a case I recently had in my office, are probably the most interesting of them all, as this case shows the overgrowth of both the maxilla and mandible better than any of the others that I have so far reported. Strange to relate here is a coincidence as in the other cases, namely, that we find the mother suffering from and being treated for thyroidism,

either hyper- or hypo-. As much as some orthodontists desire to overlook this state of affairs, they can not get away from this phase of the subject, and therefore all of us must go deeper into our investigations along this line. In the above mentioned two cases, Figs. 28 and 29, I desire to report here, both have been under medical supervision for a year, and I am glad to state there has been no increase in bone growth, although at the age of thirteen one would expect some further normal development, thus showing that the increase previously reported has been arrested, and now orthodontic treatment

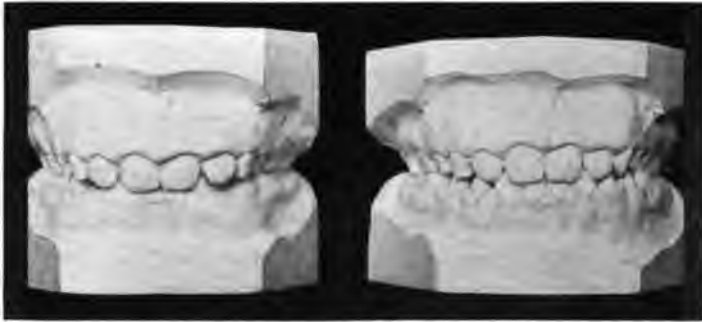


Fig. 32.—Front view of the case showing the beginning and half way through treatment, showing opening of the bite.



Fig. 33.—Occlusal view of Fig. 32 showing a progressive case of ages ten, thirteen and fourteen, showing increase of bone growth and spacings between the teeth, peculiar undersized shape of second premolar.

might be of some assistance. How strange it is that only recently we began to realize that this growth must first be checked physiologically before beginning treatment of these cases.

Another phase of internal secretion, one that the orthodontist meets often but has not as yet realized the vast importance of, is shown in the Fig. 32; at the same time I know that this case has proved of interest to various

men. I did not take into consideration, until I was led astray, certain important fundamentals at the beginning of treatment. Therefore I will give a brief history of this case, knowing it will bring to your mind similar conditions which some of you undoubtedly have met. Fig. 32 shows the front views of the case at the beginning and half way through treatment, after I thought that occlusion was established and the bite had been opened. Had the teeth been normal in shape and size, the case might have held, but instead has now returned to its original condition. As can be seen in the occlusal view (Fig. 33), the one on the extreme right shows a marked increase in structure between the four posterior teeth. This is not due, however, to abnormal bone growth as at first might be presumed, but to a decrease in tooth structure in the permanent dentition, for the spacing has remained



Fig. 34.—Supposedly missing lower canine found at right angles and at the apex of the lower second molar.



Fig. 35.—Illustrates a similar condition found in three members of the family.

the exact size of the deciduous molars. Not only had the teeth decreased in size, but the second premolars are malformed in shape. As shown in my paper of last year (published in the January number of the *Dental Items of Interest*, and the *International Journal of Orthodontia*) internal secretions do affect the size of the teeth as well as their form, but the question naturally arises of how we are to determine this when treatment is begun and before the permanent teeth have erupted.

In the case of missing or supposedly missing teeth Fig. 34 illustrates how misleading small film radiograms might be misinterpreted. A young man thirty-two years of age lacked a lower right permanent cuspid; radiograms of that locality fail to reveal a tooth. After taking a full plate, located the

cuspid at right angles and at the apex of the second molar, as seen in the above figure.

It is not unusual to find conditions that are similar in various members of the family as will be seen in Fig. 35. Three sisters, all having the upper right side occluding within the lowers and the same peculiar rotation of



Fig. 36.—Illustrates a case where we presume the second lower deciduous molar has been lost.



Fig. 37.—Maxillæ and mandible. Occlusal view of Fig. 36.



Fig. 38.—Radiogram of Figs. 36 and 37 showing not only the presence of deciduous second molar, but also an impacted second premolar.

the upper central incisors (the one on the left having lost her upper and the permanent have erupted as in the other two cases). Another child, a boy, also shows this same tendency. Again we find that often-repeated question: What part does heredity play in our work?

Some years ago, a member of this society, I believe, formulated such a rule, where we find depressed deciduous molars especially the second we were pretty apt to find the premolars missing. Fig. 36 shows a case in which it was presumed the second deciduous molars had been lost as there was no indication nor room for them, as seen in the above Figs. 36 and 37. That



Fig. 39.

Fig. 40.

Fig. 39.—A case of macroglossia, upper dental arch showing spacing between the upper central and incisors.

Fig. 40.—Showing the same separation in the mandible between the central incisors, also transposition of teeth. The left lateral, canine, and central, on the right the lateral, central, and canine.



Fig. 41.—Front view occlusion of Figs. 39 and 40.

this rule does not hold good is indicated in Fig. 38. This radiogram not only reveals a rotated impacted premolar, but also a deciduous molar imbedded far below the gum margin.

Before closing it is my desire to present two cases of macroglossia and the extreme difference as to the course each took. Fig. 39 is that of a young man twenty-two years old, the macroglossia in this patient has resulted in a wide separation of the anterior teeth with extremely large dental arches. A careful observation of the lower (Fig. 40) reveals not only this spacing, but also a remarkable transposition of teeth, the laterals taking the place of

the centrals, better seen in the mouth than in the slide, as those that are now first I find are the larger teeth, while the left cuspid is found placed between the laterals and the centrals. This case has retained the normal mesiodistal relation (Fig. 41). According to the mother's description, the father suffers from a malady similar in form and result to that seen in the son.

Fig. 42 is that of a child three years of age. This time the enlargement of the tongue has caused the mandible to protrude as shown by the position of the temporary cuspids, with a slight increase of bone growth between all the teeth. An extreme open bite has resulted with a retardation in alveolar develop-



Fig. 42.—Child three years of age. Macroglossia.



Fig. 43.—Front and side view showing the effect on the dental arches and occlusion.

ment in height, yet Nature is trying to do her best by holding in apposition the last three teeth on the left side. Owing to the difficulty in cleaning the teeth most of the dentine has been attacked and broken down, as shown in Figs. 42 and 43. Fig. 44 shows a radiogram of this case and the effect of tongue pressure. As the tongue is being reduced in size by the time that the permanent teeth erupt orthodontic treatment might be of some assistance. Figs. 45 and 46 are photos of the child, the side view showing the effect on the profile due to the inability of the tongue to remain in its normal position. Fig. 47 shows the condition of the tongue.

The cases presented here are but a few that illustrate abnormal conditions met with in our orthodontic practices, and are still to be solved; we all have as interesting ones and as repeated requests have been made for our cooperation



Fig. 44.—Radiogram of the case, showing the presence of the germ of the permanent teeth.



Fig. 45.—Front view.



Fig. 46.—Profile view.

from associated scientists it is our duty as individual members to permit those men the use of that material they so eagerly seek. And in conclusion on their behalf I make such a request with a suggestion that the Executive Committee



have a number of such papers which will stimulate thought along these lines with the hope that in the very near future we will have some definite knowledge which will be of value in our practical work.

*Dr. Weinberger.*—Dr. Federspiel's copy was sent him at the same time Dr. White's went out, and that was ten days prior to the meeting. I am sorry he did not receive it before leaving for Chicago.

I have merely touched on certain interesting material found among our varied collection of cases, offering no solution to the problem, as I believe it beyond our ability. However, in presenting these cases it might act as an incentive to others and when a sufficient number have been obtained, other scientists might then be able to solve these questions for us.

In the case I called pyorrhea, there was a great amount of pus present, therefore, it had become chronic and could not be classified as the other so-called earlier symptoms of types of this condition. I agree with Dr. Federspiel that pyorrhea is a symptom of a condition and not a disease.

Perhaps it may be true that we think with our internal secretions, at any rate one thing is certain, that is a great many men who have brains never use them, or let us say, never allow them to be stimulated, in those cases not knowing just what are the exact functions of the endocrine organs, it might be proper to put the responsibility upon those same organs that are now being blamed for practically half of our illness. I thank you.

## THE VALUE OF ENLARGED PHOTOGRAPHS OF PATIENTS IN PRACTICE\*

BY GEORGE F. BURKE, D.D.S., DETROIT, MICH.

**A**FTER completing a course at the Dewey School of Orthodontia several years ago I became impressed with the importance of having a means of making clear to people what could be accomplished through orthodontic treatment. Models do not tell the whole story. Textbooks, unless you are fortunate enough to have one of your own, do not answer the purpose, for it is not your own work. After going over this subject, I have concluded that parents and patients more quickly understand what you propose to accomplish where one uses both models and photographs.



Fig. 1.—An album keeps enlarged photographs in good condition.

Some men in this field keep carefully the pictures of their patients showing conditions before and after treatment. Others pay very little attention to it. In some instances they will be slipped into some drawer, and mixed up with odd bits of stationery, and when they are most needed, one is unable to find them. Delay occasioned by searching around in some drawer for a missing picture is annoying, and not unlike hunting for a collar button that has fallen under the bed.

In order to make sure that photographs will be preserved in good order, I have for some time made use of an album, as shown in Fig. 1. The picture, taken before treatment was taken up, is placed on the left, and finished result

\*Read before the Alumni Society of the Dewey School of Orthodontia, Chicago, Ill., 1918.

*A.**B.**C.**D.*

Fig. 2.—A very attractive young lady, showing both pictures and models of her teeth taken at the beginning and end of her treatment.



A.



B.



C.

D.

Fig. 3.—Shows both pictures and models before and after treatment. Period of treatment nearly three years.

on the right. They are not retouched, but they are uniformly enlarged. Neither are these pictures taken of all the children, but only of those where we feel that the treatment will change the facial contour or expression.

One forms a very strong attachment for a collection of photographs of children who have gone through treatment. During a considerable period they come frequently into one's life, and we learn much of their habits, peculiarities, and their hobbies. In many instances, we grow very fond of them, and our memory goes back, as we turn over the pages of such an album, to the time when either the child or one of its parents was kind enough to express appreciation of what had been accomplished. Both because of our friendship for these young people, together with a just pride that we take in seeing this work carried to a successful completion, we attach an immeasurable value to a book filled with such photographs.

The album shown in Fig. 1 has a cover made of soft vellum leather brownish in color and smooth in texture. It has loose leaves, and they are of very heavy black cardboard and not easily wrinkled. Extra leaves are kept handy so that additions can be made from time to time. The photographs are mounted in each instance so that the case before treatment will appear on the left, and the completed case on the right.

Parents bring their children for orthodontic treatment frequently with much hesitancy. In many instances they have heard ugly rumors in regard to this service. They have heard that it caused pain. They have been told that the appliances will cause the teeth to decay. It has also come to their ears that the teeth after being moved do not always remain where the operator intended they should.

Many people are like those from Missouri, when it comes to deciding on the wisdom of having their children treated for malocclusion. These enlarged photographs furnish one a splendid medium of impressing people with the changes that result through treatment.

Where parents bring children showing a condition of marked Class II, and express a wish to have such conditions corrected, one can not by means of models show what changes can be looked for in the teeth alone, and without photographs one can not make clear the very great changes to be expected through correcting the malocclusion. Where the features are affected by the malocclusion, benefits to be derived from treatment can not be made clear without suitable pictures such as are found in the accompanying illustrations.

Do you think that any parent wishes to bring a child up with such features as the cartoonist makes use of in his caricatures of a pugilist or professional ball player, when she once realizes that marked benefit will result from proper attention? Never, provided she has education, forethought, and funds to carry it through. Models may show that the upper teeth are distal in their relation to the lower, but the parent will not be convinced that changing the relative position of the teeth in one arch to those in the other, actually does reshape the chin, lips, and cheeks until she sees photos, showing other cases that have been treated. Orthodontic treatment is so clearly indicated in thousands of cases



A.



B.



C.

D.

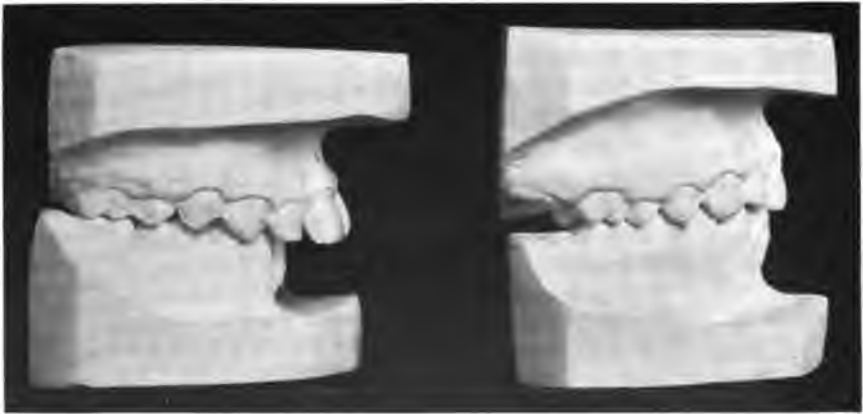
Fig. 4.—Genuine appreciation on the part of both patient and parents has resulted in case of Fig. 4. Period of treatment two and one-half years.



A.



B.



C.

D.

Fig. 5.—The photographs and models tell their own story. Period of treatment more than three years.

that have to go untreated, that it would seem that this whole subject should be studied by the very best professional and business minds with the end in view of meeting the great needs of this work in a more satisfactory manner.

This country, owing to its very large middle class, has more trained orthodontists, without doubt, than all the other countries combined, and as one surveys the whole field both among the laity, and in our own specialty, one is very much inclined to feel deep gratitude toward such men as Angle and Dewey for their service in giving instruction in this subject to such a large number of men and women who have carried on their work in so many different localities.

The demand for well-trained men in orthodontia is not growing less; it is on the increase, and there are a number of reasons why the demand for this service should grow. In the first place those that have followed carefully the teachers of this subject in a good postgraduate school are getting highly satisfactory results. Then the mouth hygiene movement is doing much to direct the attention of parents to faulty occlusion of the teeth. Health exhibits are a strong educational factor. "How to Live," by Irving Fisher, and "Breathe and Be Well," by Dr. Howard, are books that are both being widely read today, and both have chapters dealing with this subject. The passing of John Barleycorn will give people more funds to spend in behalf of their own physical welfare.

By means of the draft employed to raise the army in this great war, from which this country has just emerged, the fact should be driven home to legislative bodies in this country that physical defects and disease bar the way to many who would serve their country at such a time. The fact that so many fail to pass the tests in such a crisis would lead one to believe that one of the prime benefits to be derived from such a conflict would be an awakened conscience relative to the whole subject of hygiene, resulting in a willingness on the part of the people to spend appropriations freely in the matter of health propaganda, so that there will be less disease.

Before leaving the subject of pictures, it is my wish to dwell for a brief period on another kind—the shadow picture or radiogram, which in the hands of many men is a splendid means of diagnosing conditions about the mouth. While in recent years this method has been in much more common use than formerly, there still remains much educational work to be done before they will be used as extensively as they should.

Both the medical and dental profession appear to be divided into three great classes. First, those that never use radiograms; second, those that refer such work out now and then; and, third, those whose offices are fully equipped with suitable apparatus, and who make the fullest and freest use of it, as occasion requires.

Let us take, for instance, the case of two dentists located in a small town, suppose that one makes free use of the x-ray in his diagnosis, and that the other does not know its value and refrains from its use. Who is going to be right more often in diagnosis? You know the answer, and we also know that the thoughtful people living thereabouts will know the truth some day, and that the man who makes the smaller percentage of mistakes in his work from day





A.



B.



C.

D.

Fig. 6.—A very marked case of protrusion of the mandible. Corrected after a period of treatment extending over a period of two years.



*A.*



*B.*

Fig. 7.—Shows picture taken before and after treatment. The arches were somewhat mutilated.



*A.*



*B.*

Fig. 8.—*A* shows a patient with upper incisors distal to the lower incisors. *B* was taken 18 months later, when the relationship had been changed.



Fig. 9.—A cabinet for models of patients under treatment.



Unerupted teeth.



Unerupted premolar.



Unerupted cuspid.



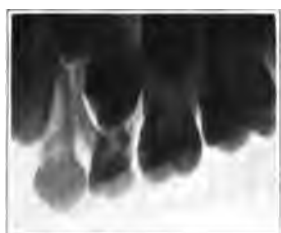
Unerupted cuspid.



Unerupted premolar.



Unerupted cuspid.



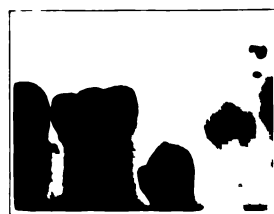
Unerupted teeth.



Unerupted cuspid.



Unerupted teeth.



Unerupted premolar.

Fig. 10.—Good radiograms are indispensable in diagnosis.

to day is the one who will have the confidence of a large number of that class of citizens whose patronage is most sought.

The subject of radiography is never called to my attention but my mind goes back to a scene in a hospital operating room where an unfortunate woman was being operated on for removal of a lower impacted third molar. Her case history showed that she had suffered for a period of eight years from facial neuralgia. As the patient wore full upper and lower dentures, it was not at first suspected that the real cause of the ailment was an unerupted tooth. But after this very long period of suffering she was finally prevailed upon to have used the x-ray, revealing as it did this tooth, located down towards the angle of the jaw. Its successful removal resulted in an early recovery.

The splendid work done by such men as Hartzel, Mayo, Morehead, and Price would indicate that there are thousands and thousands of patients in hospitals and occupying invalids' beds, who if they could be prevailed upon to have their dental arches radiographed, and the necessary corrective work done as indicated, many of them would, in a comparatively short time, be in position to regain their health.

In orthodontic practice, radiograms reveal which teeth are missing and by means of it one can check up the progress being made by teeth that have not yet erupted, and the presence of a good outfit in your office results in a greater degree of satisfaction on the part of patients. My experience teaches me that they do not wish to be referred to others every time one wishes a radiogram. It establishes an operator, in their minds, as one who is more fully equipped in the matter of appliances, than the one who is groping in the dark in regard to those matters that are so important to the welfare of patients.

## SOME PROBLEMS OF THE ORTHODONTISTS\*

BY MRS. EDITH S. ROBERTS, WARRENSBURG, MO.

*Dental Hygienist*

THE world moves. Science is progressing in these days, not by inches and feet, but by leaps and bounds. Not only has the world witnessed during the past three years the most wonderful advancement in the horrible methods of warfare, but also in the multitude of life-saving agencies. These include, among others, the wonders of modern surgery; the many activities of the Red Cross and Ambulance Corps; the preventive measures of vaccination and inoculation, and a fuller knowledge of hygienic living. Nor must we neglect to mention the remarkable results of the Dental Research Committee, the mouth hygiene movement, and last but not least, the strides taken in orthodontic circles. But the end is not yet. Greater evils require greater remedies and preventive measures.

The medical and dental examination of school children for the past few years has proved the crying need of the medical and dental clinics, toothbrush drills, and "mouth hygiene" weeks. And yet, above and beyond it all is the prophetic dawning of a greater life-saving movement. It is the glimpse of a day when the orthodontist, the physician, the psychologist and the social worker will labor hand in hand for the suppression of crime, and the elimination from our midst of the feeble-minded, delinquent and otherwise abnormal and inefficient people. The intimate relation of mind and body, of brain and face, bring the orthodontist and psychologist face to face with the same problem. Let this problem be our theme for a few minutes.

Reports of dental clinics being carried on in the public schools of several hundred cities of the United States, and also in institutions and among the industries, prove that irregularities of the teeth, and malformation of the jaws and face, are so prevalent that urgent measures should at once be adopted to correct these great evils.

Dr. Lischer, in his book "Orthodontics" says, "It has been estimated that fully fifty per cent of the children of every community are afflicted by some form of malocclusion of the teeth." There are fully 20,000,000 children marching to school every day in the United States. If it is true as Dr. Lischer says, that fifty per cent of these children are afflicted with some sort of malocclusion, it would then appear that about 10,000,000 children are this very day awaiting your services in the United States.

"Well, what of it?" you say. Just this. Malocclusion causes, first, overlapping teeth, and hence their rapid decay; second, insufficient mastication, causing malnutrition, lowered vitality, and retarded development, along with the train of ills which follow; third, restricted arches, which means also restricted nasal cavities, and lack of proper development of the internal face and base of

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\*Read before the Alumni Association of the International School of Orthodontia, Kansas City, Mo., July, 1918.

the brain. These and other results of malocclusion are quite enough to partly account for the many cases of deficient children and adults in this country.

Just how these physical defects affect the mentality and morality of a human being is a very interesting study, especially when combined with the study of psychology.

The human mind is necessarily influenced more or less by the brain and nervous system. Anything, therefore, which limits or retards the growth or proper function of the brain, limits and retards the free, natural and normal growth and function of the mind.

Would it not be true then that in cases of malocclusion in which are found the misshapen, undeveloped or restricted arches, we will find that the inner face and base of the brain are also affected? If so, when the brain case is not properly grown and expanded, not only the brain but the mind also has not developed as Nature intended it should.

Does this mean then that abnormal and inefficient children are growing into delinquent adults? Yes, even worse, for some students of psychology tell us that some of them are developing into criminals as well. A study of the faces of hundreds of thousands of criminals, feeble-minded, delinquent, abnormal and otherwise inefficient people prove that undeveloped and malformed jaws are one cause of many such pitiful cases.

To be sure, we must remember that we have the much talked of "heredity" and "environment" to reckon with. But after all is said, has it not been proved that when science has baffled the habits of Nature in heredity, and sociology has changed the environment, there is so remarkable a change in the growth and life of a child that it appears to be little less than a miracle?

As an example of what science can do in improving the mentality of a child by removing irritating causes near the base of the brain, I refer you to the many cases of adenoids which have been successfully removed. True it is that in a majority of cases, the inefficient child who *was* dull and listless at school became bright, active and otherwise normal after the adenoids had been removed.

We do not claim that undeveloped faces and jaws are the sole cause of inefficiency and lowered mentality. Are they not, however, probably the cause of a sufficient proportion of such cases that it will more than repay the orthodontist for his time and effort in making a somewhat careful study of psychology in connection with his practical work?

Dr. A. C. Fones of Bridgeport, Connecticut, has said, "Unequal brain development means an abnormal brain, and an abnormal brain means abnormal thought and action." Through the handicapping influences of undeveloped brain cases there follows the undeveloped mind. Because of this many children who *might* be leaders in politics, business, industry, science, art and religion are denied the opportunity of normal development. Dr. Higgason in *Oral Hygiene*, July, 1916, says, "A child is a bundle of possibilities and often, wrapped therein are the undeveloped talents of a genius."

Because of all these facts we rejoice that some research work is being done

in the study of the ductless glands of the body; for it may be that the study of the pituitary bodies occupying a small space at the base of the brain case, will bring to us a much-needed remedy. Although it is difficult to find much information in print on the function of these small bodies, yet the little we do read arouses our interest and increases our desire for a wider knowledge.

In the August, 1917, number of *Oral Hygiene* an article by Dr. W. Claude Adams of Portland, Oregon, gives us a thought or two on the mysterious function of the ductless glands. He says, "If anything happens to one it affects the others; and the loss or degeneracy of any one of the ductless glands robs the body of a necessary function." Another time he says, "The thyroid and pituitary are antagonistic, the thyroid diminishes, and the pituitary augments blood pressure."

He quotes Dr. Josefson of Stockholm and others who maintain that dentition and the growth of hair are controlled by these glands. Some claim that the growth of the whole bony framework of the body is governed, and the size of the individual is determined by the pituitary bodies. Dr. Woods Hutchison has said, "We are such stuff as ductless glands are made of."

Have you not read the opinion of some scientists who claim that the pituitary body is the king on the throne, the very seat of life, controlling the mind and nervous system?

Should this be true, would it not be an easy matter to conclude that a lack of proper development about the base of the brain would interrupt the normal growth of this most important part of the human body? If restricted upper arches, restricted nasal cavities, adenoids, etc. (which things are usually found together) so retard the proper development of the lower brain, would this not interfere with the proper function of the pituitary bodies and thus limit the growth of mind and body?

Could it be proved to the public for a certainty that expanding the upper arch and relieving the pressure on the lower brain and enlarging the nasal cavities would restore the proper physical and mental development of the brain, there would be no doubt but that several times as many orthodontists would be required as can be found in any community.

What a pity that ignorance has so blinded the eyes of the public as well as of the dental profession that we can not see that physical defects of the head and face are perhaps the leading cause of a child's state of mentality, and grade of intelligence.

Terman, the psychologist, in his book, "The Measure of Intelligence," says, "With the exception of moral character there is nothing as significant for a child's future as his grade of intelligence. Even health itself is likely to have less influence in determining success in life. Schools, railroads, factories, and the largest commercial concerns may be successfully managed by persons who are physically weak or even sickly. One who has a high grade of intelligence constantly measures opportunities against his own strength or weakness, and adjusts himself to conditions by following those leads which promise most toward the realization of his individual possibilities." Hence, from this we



infer that since physically weak persons may possess a high degree of mentality and win success, the opposite may be true that persons of lowered mentality may fail in attaining it, even though blessed with excellent health. And so we should no longer blame mentally defective workmen for their industrial inefficiency or punish weak-minded children because of their inability to learn. Rather, we should see to it that children of whatever station in life be given every opportunity to grow and develop mentally as well as physically.

Dr. Terman, who has studied the grade of intelligence of school children for some years, says that from one-third to one-half of the children of our public schools fail to progress through the grades at the expected rate; and from ten to fifteen per cent of them are retarded two years or more. Then, too, remember there is an army of feeble-minded children who are not able to attend school, and as many more adults, some of whom become idiotic and criminal. Might it not have been that a certain proportion of these could have been made mentally normal, had the orthodontist been permitted to relieve the disturbing influences at the proper time in life?

As to the close connection between mentality and morality, Dr. Terman says, "Without exception, every study which has been made of the intelligence level of delinquents has furnished convincing testimony as to the close relation existing between mental weakness and moral abnormality. Some of these findings are as follows:

"Of a hundred girls tested at the Ohio Reformatory, 36 per cent were feeble-minded.

"Of a hundred Juvenile Court cases chosen at random in Newark, N. J., nearly 50 per cent were classified as feeble-minded.

"The test of a hundred prisoners at the Massachusetts State Reformatory showed that 25 per cent were feeble-minded.

"Of 1,186 girls tested at the State Industrial School for Girls at Lancaster, Pa., 28 per cent were found to have abnormal intelligence.

"At the State Reformatory, Jeffersonville, Ind., in an unusually thorough psychologic study of 1,000 young adult prisoners, it was found the proportion of feeble-mindedness was not far from 50 per cent.

"But it is needless to multiply statistics. Those given are but samples. Tests are at present being made in most of the progressive prisons, reform schools, and juvenile courts throughout the country, and there is no investigator who denies the fearful role played by mental deficiency in the production of vice, crime and delinquency.

"To be sure, all criminals are not feeble-minded, but all feeble-minded are at least potential criminals. Moral judgment, like business judgment, or any other kind of higher thought process, is a function of intelligence. Morality can not flower and fruit if intelligence remains infantile."

It is said that the cost of vice and crime in the United States is not less than \$500,000,000 per year. This is the cost in cold cash. The cost to society, including the loss of precious lives, as the result of vice and crime can never be estimated. Can we not indulge with confidence in a prophetic vision of the

future when the orthodontist will be called on to save his share of lives, not only from physical wreck and ruin, but from mental and moral degeneracy?

Another problem presents itself to the orthodontist. It is the problem of the education of the public. Could the parents of every child afflicted with malocclusion, realize the effect those conditions must have on his mentality, health and general development, many of them would at once seek the remedy if they knew it was available. Should the orthodontist undertake the education of the hundred million population of the United States he will find the task overwhelming and impossible. Impossible, not only because of the immensity of the task, but also because of his timidity in teaching a gospel which "might make him appear as a salesman recommending his wares."

And so, as in algebra, it is sometimes necessary to introduce into an equation an unknown quantity in order to bring the correct results, just so the orthodontists need another factor to assist them in the education and awakening of the general public.

It is here that I wish to introduce to you the most efficient ally of the orthodontist, the dental hygienist, who may be that needed factor. What she has accomplished in the mouth hygiene movement the past three years may be taken as an index of what she may be capable of doing to advance the cause of orthodontia.

As all may not be familiar with the work of the hygienist, I will say that her one year's training instructs her in present mouth conditions, especially among children, and her efforts are mainly along the line of preventive dentistry. Her careful examination of the mouths of school children brings to light the cases needing regulation. A tactful talk with the child in regard to his crooked teeth, a talk with the teacher, who is usually willing and ready to lend her aid, and a subsequent call on the parents, to whom conditions and remedies are explained, and the hygienist has made a fair start toward bringing the afflicted child to the orthodontist. She keeps in mind these cases which should be under treatment, and as far as tact and propriety will permit, follows up the first visit with other efforts to induce the parents to have their child's case placed in the hands of an orthodontist.

When this is accomplished she may, when necessary, accompany the child to the office or clinic for treatment, and see that the child and parent understand their part in the undertaking.

Thus she becomes a very useful assistant to the orthodontist.

But aside from her individual oversight of each case, she will often have an opportunity to lecture to mothers and teachers, to whom she can present the symptoms and evils of malocclusion as well as the preventive measures. The broad field awaiting her efforts along the line of preventive work can scarcely be comprehended and its great need can not be doubted.

In the June number of *Oral Hygiene*, 1918, is an article on "Irregular Teeth" which is an extract from a lecture to parents given at the Free Public Health Lecture Course of the Forsyth Dental Infirmary, Boston, by Dr. Frank Delabarre. Among other things he said, "Civilization seems to be largely respon-

sible for the prevalent condition of irregular teeth, as it is rare among primitive peoples.

"In America today, probably 75 per cent of the adults have irregular teeth. The observations of specialists reveal a startling contrast. They find that a very large percentage of children who have reached the age of two and a half or three years, when the temporary teeth have all taken their place, have normal development of the face and jaws. There are no figures to state this percentage accurately, but it is safe to say that it is over 80 per cent, and perhaps over 90 per cent. Compare this with the 75 per cent of irregularities among adults, and it is seen at once that there is an age somewhere between, when irregularity starts in a large majority of individuals."

Some one has said,, "Ninety-five per cent of children lose their first teeth before Nature intended they should."

Hence there is no doubt but that dental decay in young children is responsible for a certain proportion of the cases of malocclusion.

Many opportunities will present themselves to the dental hygienist to instruct the public and banish the ignorance of these matters so prevalent today among the masses. The scope of her work has progressed until it has reached the proportion of (1) An assistant to a dentist or orthodontist, (2) A social worker, (3) A teacher's helper, and (4) The school child's friend.

Her purpose is to teach preventive dentistry, and preventive orthodontia; to educate the rising generation, parents and general public in mouth hygiene, and to bring together the little patient needing dental attention and the dentist, as well as the child needing orthodontic treatment and the orthodontist. The useful work of the dental hygienist proves to the dental profession that she has come into the professional circle to stay. I urge all orthodontists and dentists to encourage in every way possible the establishing of schools for dental hygienists in every large city. Her work in the past has accomplished much to promote the success of mouth hygiene, where she has been permitted by the state dental laws to practice. Although the new profession of dental hygienist, bestowing the degree of D. H., may have been an experiment, it has proved to be a successful one which has brought astonishing results.

While the revised laws of five states, viz., Massachusetts, Connecticut, New York, Maine and Iowa, permit the hygienist to clean and polish teeth, yet her greatest aid to the dental profession will be in educating the public to the need of the dentist and orthodontist.

When this is appreciated by the dental profession, the dental laws of other states will doubtless be so amended as to allow the hygienist to practice; and there will be a demand in the schools throughout the land for her services as a teacher of hygiene of the mouth as well as an assistant at the clinics. May this day soon come.

## **DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA**

Under Editorial Supervision of

**M. N. FEDERSPIEL, B.Sc., D.D.S., M.D., F.A.C.S., MILWAUKEE, WIS.**

*Professor of Oral Surgery in Marquette University*

### **Recurrent Dislocation of the Lower Jaw. J. B. Blake. Annals of Surgery, 1918, lxxviii, 141.**

Dr. J. B. Blake reports an interesting case of recurrent dislocation of the lower jaw as follows:

The patient, a man of twenty-seven, was rather a pugnacious individual; he had frequent and violent physical contact with his fellow-men; during these gentle passages at arms he suffered the dislocation of the jaw many times.

As a result, he gradually became unable to laugh without dislocation or yawn without the same inconvenient occurrence. He could not sleep without imminent danger of waking to find his mouth wide open and his chin fixed upon his chest, being compelled to seek immediate surgical aid. His dislocated jaw was reduced at the Boston City Hospital Relief Station, near which he lodged, at least forty or fifty times and as often as more than once in the same night. He had tried bandages, but of no avail, possibly because he did not wear them long enough for a fair trial; operation was the only form of treatment that offered hope of success. A careful examination proved to impress the operator with the disadvantages of attacking the joint itself in a condition so marked as this, and remembering the familiar method by which the lower jaw bone is held to the skull in the mounted skeleton (a spring tacked above to the temporal bone and below to the coronoid process), he concluded that something of this nature might be effective; that is, that the coronoid process be bridled to the bony skull, and the zygomatic arch suggested itself, at a glance, as the obvious anchorage.

The patient agreed to the operation, understanding that he must assume some chance, since there seemed to be no precedent for the procedure. An incision was made along the lower border of the zygomatic arch and the fibers of the masseter separated from it. This incision was well above Stenson's duct and parallel to the facial nerve fibers. With some difficulty, the coronoid process was reached; it was much deeper than had been anticipated, and the operator was not able to do what he had originally planned; this was to drill through the tip of the coronoid, thread a piece of wire through the hole, and

lace this over the zygoma. He looped the silver wire, first over the zygoma, and then brought it down and carried it through the insertion of the temporal muscle and the periosteum on the front of the coronoid, twisted the ends together, flattened it, and closed the wound without drainage. The wire loop was long enough to allow the jaw to open for two cm. or one inch between the incisors. The masseter was carefully sutured to its origin; bandages held the jaw closed; and the wound healed by first intention. The jaw was immobilized three weeks. For some time the patient would not open teeth more than one cm., afraid that it would slip; but he gradually gained confidence and a wider range of motion returned. A year after the operation, the jaw became normal and reliable in every way. The x-ray shows that the wire has twisted from its original position, but it does not cause any discomfort and gives a mental sense of security to its somewhat excitable and erratic possessor.

# DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Under the Editorial Supervision of

JAMES DAVID MCCOY, D.D.S., Los Angeles—ROBERT H. IVY, M.D., D.D.S., Milwaukee  
B. FRANK GRAY, D.D.S., San Francisco—C. O. SIMPSON, M.D., D.D.S., St. Louis.

It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

## A CASE OF "IMPACTIONS" OF INTEREST TO THE ORTHODONTIST, WITH THE TREATMENT AND RESULT OBTAINED

By JAMES DAVID MCCOY, D.D.S., LOS ANGELES, CAL.

*Professor of Orthodontia and Radiography, College of Dentistry, University of  
Southern California*

ON more than one occasion I have been responsible for the assertion that an x-ray examination should constitute a regular part of the routine in the examination of our cases. The truth of this statement is brought directly home in a case in which I failed to practice what I have so vigorously preached.

The case under discussion was placed under treatment in May, 1912. The patient was a boy twelve years of age who had a case of Class II, Division 2, without any unusual complications. Both arches were somewhat arrested in development, but all of the permanent teeth, anterior to, and including, the first permanent molars, were present, although the left upper second bicuspid was inside the arch and had only erupted to a point where one of the cusps showed through the gingival tissue. Owing to the fact that all of these teeth were accounted for, I did not deem it necessary to make radiograms as fullness of the structure posterior to the first permanent molars seemed to indicate that the second molars were about to erupt.

Treatment of the case was carried on without mishap and the teeth present in the mouth placed in their normal relations and retaining appliances were adjusted.

At the end of a year the right upper and lower second molars erupted, but there was no sign on those of the left side. Most of the retaining appliances were removed and the patient went away to school and was not seen for quite a long period.

In July, 1918, the patient again called for consultation and an examina-

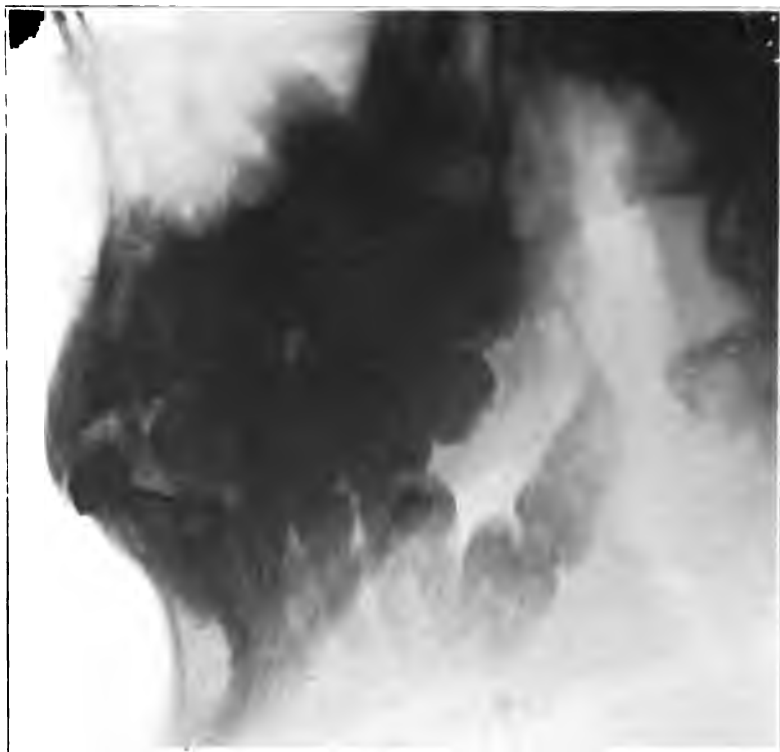


Fig. 1.



Fig. 2.

tion of the mouth showed that *the second molars on the left side had not yet put in their appearance*. Inasmuch as these teeth were about six years late, a radiogram was made which revealed the condition shown in Figs. 1 and 2.

The question now arose as to the best method of handling this unusual situation. After consultation with an exodontist, it was decided best *to remove the upper first molar and the lower third molar*. This was done by Dr. Frank L. Warren.

On December 1, 1918, another radiogram was made which is shown as Fig. 3. The upper second molar has come downward and forward and is assuming



Fig. 3.

a very good relationship with the lower first molar. The lower second molar is about to erupt and the upper third molar has ample space to come down and take the place of the second molar which has moved forward.

The fact that the upper first molar was extracted will undoubtedly appear to many as being unwise. However, we were guided in this, first by the fact that this tooth contained a rather large filling, secondly, because we wished to save the patient all we could in the way of shock and laceration to the tissues, and as the upper second molar was entirely unerupted, we chose this method as being the best suited to this individual case.



## A METHOD OF MOUNTING DENTAL FILMS\*

BY E. B. KNERR, M.D., KANSAS CITY, MO.

A METHOD of mounting dental films which I find to be entirely successful is shown in the accompanying photograph. At each corner of the film negative a small portion of the emulsion side is scraped away by a sharp knife or chisel, as shown at (a). To each of these corners so prepared a minute drop of celluloid cement is then applied and the film immediately thereby cemented to the *smooth* surface of a strip of frosted celluloid backing, pressing the corners down for a few seconds by the fingers. The warm fingers aid in setting the cement and binding the film to the backing. The celluloid cement is pre-



(a) Emulsion removed at corners of films.  
(b) Frosted celluloid backing.

pared by dissolving discarded films cut up into small pieces in acetone and diluting to the consistency of thin syrup by adding more acetone. Filter through cotton and add about one-tenth volume of 98 per cent alcohol to act as a retarder to its setting. The cement may be applied to the film corners by a bit of wire passed through the cork of the containing bottle. The bottle should be kept well corked as the acetone is very volatile. Should the cement thicken it may be readily thinned by adding acetone. The celluloid backing may be purchased in large sheets and cut to any dimensions desired, allowing such margin as may be advisable for descriptive matter to be written in.

\*Published by permission of the Journal of Roentgenology.

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## EDITORIALS

Dr. Leonard E. Stanley

DOCTOR LEONARD E. STANLEY died of anemia in Ottawa, Ontario, on Tuesday, December 10, 1918.

Dr. Stanley was born in Greeley, Ontario, in 1877. He obtained his early education in Greeley and Metcalfe, afterwards attending the Kemptville High School where he matriculated for dentistry. In 1900 he entered the Royal College of Dental Surgeons, Toronto, and was graduated in 1904. His preceptor was Dr. Alex Armstrong, of Ottawa, now Lieut.-Col. Armstrong, head of the Canadian Army Dental Corps in England. He was a clever student and in his senior year was demonstrator to the freshman class in operative dentistry. Immediately after graduation he began practice for himself in the city of Ottawa. In 1907 Dr. Samuel S. Davidson, now the oldest practicing dentist in Ottawa, asked Dr. Stanley to become associated with him. They worked

as associates until Dr. Stanley's illness last May. In the summer of 1915, Dr. Stanley attended the Dewey School of Orthodontia and was graduated from that institution. He was a member of the Canadian Dental Association, and at the Montreal meeting in 1916, opened the discussion on Dr. W. H. Logan's paper on Conductive Anesthesia. His illness prevented him attending the Canadian Dental Association and National Dental Association meeting in Chicago last August. Up to a short time previous to this meeting he expected to recuperate sufficiently to attend, and he regretted keenly his inability to do so. He was a member of the Ontario Dental Society and attended the 1918 meeting last April. He was president of the Eastern Ontario Dental Society in 1917. Dr. Stanley was a member of Rivermead Golf Club and an enthusiastic golfer. He was also a member of the Kiwanis Club of Ottawa. He belonged to Doric Lodge, A. F. and A. M., and to the Lodge of Perfection and Rose Croix Chapter, Scottish Rite. At the time of his death he was Master of Doric Lodge. Dr. Stanley was an Anglican and attended St. George's Church.

He is survived by his widow and two little girls, Kathleen and Lenore.

Thus is chronicled briefly the principal facts concerning the life and death of Dr. Stanley, but to give these conventional items without paying a tribute to our lamented friend would indeed be failing to do what was most dominant in the writer's mind.

Dr. Stanley was a man of strict integrity; honest and truthful, unselfish, genial; a good friend and a Christian gentleman. He was a successful practitioner and a very pleasant relationship existed between him and his patients. He was still a young man, only forty-one years old and had so much of future possibility before him that his taking away is a distinct loss. He was one of the most progressive men in the dental profession and his ideals could not help but raise the status of our profession. He was never neutral on a subject for the sake of policy, yet possessed the quality of being able to differ with one most emphatically and still hold one as a friend. He had a sunny, cheery, optimistic nature, one whose cheer helps to relieve the stress and strain of our busy everyday life. The chief loss will fall on his immediate family and at this time when the shadow of their bereavement falls so heavily upon them, their chief solace must come from the fact that he was a devoted husband and an affectionate father.

"I can not say, and will not say  
That he is dead. He is just away:  
With a cheery smile, and a wave of the hand,  
He has wandered into an unknown land.  
And left us dreaming how very fair  
It needs must be, since he lingers there.  
I think of him still as the same. I say  
He is not dead, he is just away."

—S. W. B.

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*Editor: Martin Dewey, D.D.S., M.D.*

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## ORIGINAL ARTICLES

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### ORTHODONTIC CLINICS\*

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BY F. A. FLETT, D.D.S., DETROIT, MICH.

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THIS subject, I believe, was discussed at a meeting of the Pacific Coast Society of Orthodontists at San Francisco in February and reported in our *International Journal of Orthodontia* in the May number.

Orthodontic clinics for the poor are only in their infancy. I do not know how many there are in the United States, but I am sure there are very few.

The work has just begun and so far, in our city, we have only scratched the surface. We have done very little in the past; this work is for the future. When one takes up this work, goes into the schools, examines these children and sees the need for orthodontic services, the work is appalling to say the least.

The first dental clinic was established in Detroit in 1905, a few of the city dentists giving their services gratis. To Dr. George Burke we give the honor for his untiring efforts in the founding of this work. Only those who are interested in these institutions know the difficulties these men encountered in establishing this clinic.

Grace Hospital supplied a room and the services of a nurse in training. A few years after the city council gave a grant of \$5000 and this year \$25,000 was appropriated to carry on the work. We now have eleven clinics, the main one located in the Board of Health building, one in Harper Hospital, one in the Franklin Street Settlement, one in the Neighborhood Club House, one in the Detention Home and the others located in the public schools in various parts of the city.

When school opened in 1916, I went into the class rooms and examined about three thousand children and found very few with normal dentures. Some

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\*Read before the Alumni Society of the Dewey School of Orthodontia, Chicago, Ill., July 30-31, 1918.

had every tooth decayed, many had abscesses. In some cases these were discharging on the face, resulting in disfiguring scars. One case of necrosis was referred to an oral surgeon and a resection of the mandible was performed. The parents of this child were ignorant and they kept a poultice on her face most of the time, even the school physician did not realize that the services of a dentist were needed. There were a great many cases of malocclusion; in fact, normal dentures were rare. Many cases of enlarged tonsils and high narrow arches with nasal obstructions were seen. In some cases the examples of neglect were pathetic.

Our school physicians are not awake to the dental situation, and their knowledge as to what should be done and what can be done is meager, in fact some of them do not know what orthodontia means, they have never heard of it.

I paid particular attention to the children in the schools for the deaf, schools for the defective speech, schools for the mentally deficient, crippled children's schools, and in the open air schools. I was particularly anxious to take children from these schools for orthodontic treatment for the reason that the Board of Health maintains a nurse in each of these schools and I could depend upon her to have the children at my clinic or if they were absent from class make a visit to the home and ascertain a reason for their absence.

The teachers in these departments are specially trained and their cooperation is splendid. I was surprised to find on my first visit to the school for the deaf and the school for the defective speech how much these teachers knew of orthodontia and the necessity of the teeth assuming something near normal occlusion before they could get results in their line of work. The teachers in these various schools have usually done a good deal of educational work with the parents so that they are anxious to have these deformities corrected.

The children in the schools for the deaf are no longer taught to talk on their fingers, but are taught to use their voice and read the lips. I have visited this school several times to get a general idea of their methods. With the aid of mirrors the child imitates the teacher in position of the tongue, shape of lips, etc., and with the aid of a lighted candle she can teach the pupils breath control by placing the candle in front, above, below, or at one side, and if the breath is exhaled properly, the candle will be extinguished. Of course this teaching is made easier if the child has slight hearing, and the voice has a better tone. In the totally deaf the voices are peculiar, but the teachers have produced some splendid results.

It is impossible for the teacher to obtain the best results if the teeth are in malocclusion, so they resort to a substitution, using other parts of the mouth than the ones ordinarily employed.

I have one girl under treatment who, although not born deaf, became so before she could talk. The case is classified as mesiocclusion with the loss of the lower first molars. After a year's treatment the teeth assumed something of a normal relation and the voice has become quite intelligible.

In selecting your cases, if you are organizing an orthodontic clinic, I would advise you to choose those which you are sure will be a success because in a year or so after you will have something to show for your work. It is well to

take some cases where the teeth have affected the facial appearance as well as the efficiency of mastication and have photographs taken so these can be shown with models when the case is completed and the facial outline corrected.

In regard to the making of masks, these are a splendid thing to have as a record of the work and also for use in educational purposes but to make them requires a long time.

I have two or three cases of stammering, and in one case, particularly, excellent results were obtained. The model is presented here to show what has been done. There are a great many imperfections, however.

I have not been able to find much literature on the relation of orthodontia to stammering, but there is an article in the July issue of the *Journal of the National Dental Association* written by Dr. Green of New York in which he deals with speech defects. This is a splendid paper, and no doubt most of you have read it.

Next fall we intend trying by the use of the dictaphone to obtain a record of the child's speech defects. If successful, these will be very useful, as it is rather surprising how soon one forgets the actual defect after it is corrected. Sometimes we are apt to overestimate our results, and if the records could be obtained to which we could refer, it would be of great value in educational propaganda.

I have had only two cases of mental deficiency. One case left me after six months' treatment, the other case is still under treatment.

This latter case was referred to me by Captain McGraw now with the United States forces in France. The patient's permanent teeth were abnormal in shape and radiograms showed the laterals and the upper second premolars absent. Dr. McGraw was treating this child for cretinism with the extract of thyroid. The patient was sent to the Board of Education, to the psychologic clinic, where they have nurses specially trained in making the Binet examinations. This child's chronologic age was 7 years, 6 months; his mental age 5 years. The lower and upper arches were opened up the width of a lower lateral, and at first the child apparently made splendid progress mentally. This improvement was only temporary, for when a Binet test was again taken it showed his real mentality.

Here is his record:

At	7	years,	6	months,—	2	years,	6	months	below	normal.
At	8	"	9	"	—3	"	3	"	"	"
At	9	"	2	"	—2	"	8	"	"	"
At	9	"	10	"	—3	"	10	"	"	"
At	10	"	6	"	—4	"	2	"	"	"

It is necessary that we have a Binet test before starting work on these mentally defectives if we want a complete and correct record, because appearances are very deceiving in these cases.

This patient is still doing A First grade work and is classified as a high moron.

We have in the same building a very competent nose and throat specialist so that all our cases are examined by him before beginning orthodontic treatment,

his findings are charted as a matter of record; and if a surgical operation is required, it is done at the minimum of cost and the maximum of efficiency.

There is also an x-ray machine at our disposal so that impacted teeth may be located or in doubtful cases the absence or presence of unerupted teeth may be determined.

All orthodontic work is done free, it is against the policy of the Board of Health to receive money for any dental service. I think this is a mistake. There is a tendency of the municipality to do too much for the individual free of charge. In some institutions a small fee is collected for each visit, this does not pay for the maintenance at all, but it lessens in a measure the appearance of charity. The patient ought to at least make a deposit with the secretary to be returned when the work is completed or at the discretion of the operator. This would prevent parents desiring this work just because it is free. If some of them had to pay five dollars they would not have it done, they have absolutely no conception of what it means.

Very few patients have been lost after the appliance was once adapted, because I am very careful in the selection of the patient, but if they paid a deposit one could be more certain of their regularity in attendance.

The patient is required to bring a toothbrush to the clinic and it is kept in a test tube plugged with cotton. If his teeth do not show that he has taken care of them at home he is required to brush them before having his orthodontic treatment, and of course is shown the proper way to use the toothbrush.

The nurse who assisted me formed what she called "The Blue Bird Club." All the patients' names were printed very artistically on a large piece of cardboard. This was done by one of the larger boys in his manual training class. If the patient's teeth showed signs of proper care a star was pasted after his name and at the end of three months, prizes were given to those who had a star for every week. This bulletin was left in the reception hall, and it created a great deal of interest.

The dental department sends out inspectors to the schools, both parochial and public are visited twice a year. The dentists employed are usually young men just out of school, and they do not always recognize a case of malocclusion when they see it. In looking over the report for last year I find that the total number of children examined was 64,094 and the number needing orthodontia was reported as 501. If these cases were looked up, one would likely find that to be the number of those so bad that they would be incurable. They only seem to know malocclusion when the teeth are a hopeless jumble. Cases of malocclusion in the child of six are passed over, and those are the cases we should be treating, since we can take care of more cases in doing preventive work and the results are more satisfactory.

We try to make our work in orthodontia cover more than the correcting of the irregularity of the teeth.

When a patient is admitted for treatment he is examined for pediculosis and if present, we give them a printed slip with direction for the care of the same. We encourage the patient to come with hands and face clean, in fact we do not allow them to come dirty. Many of them come from homes where

they have no bath facilities, in those cases arrangements are made at the school for this, and both the patient and the parent are shown that we have more than a passing interest.

In Detroit orthodontia has never been well presented to the public, but through our clinic next year we hope to do a little more.

Arrangements are being made now to present this work to the senior nurses of the various hospitals in the form of a clinic and lecture course and in a general way present to them the science of orthodontia.

This ought also to be taken up with the senior class in the medical schools and we may possibly have this presented to them also, but just now the Detroit College of Medicine is undergoing a change from a privately owned institution to one controlled by the city, so we will have to wait until the new officers are elected or the former ones reinstated.

Another method is the public press, and by this I do not mean that the physician or dentist working in that particular clinic should use the daily papers to get a lot of free advertising. We had in Detroit a year ago a column in the daily *News* called "Bigger Better Detroit" and each week the reporter wrote up the various institutions controlled by the city. When he got around to the dental department he called one afternoon when I was not in, looked around the clinic room, examined the models, etc., got a little information from some one else and wrote an article quite untrue. His story was very flattering. He attributed to my ability all the ideals I was looking for.

We had in Detroit last month a "Better Babies Week" when mothers were invited to various centers to have their babies examined and receive instructions on their proper care, but so far as I know there was nothing said in regard to their teeth, and I do not think there were any of the dentists particularly interested in the work. There was a very valuable opportunity lost of imparting at this time important information as to the effect of food and diet upon the teeth directly, as well as upon the whole system, and of showing to the parents that malocclusion and other dental abnormalities are not the result of a condition arising in a short period of the infant's life, but are probably the consequence of conditions extending over the entire developmental period of the child.



## THE NEED OF ORTHODONTIC CLINICS OR ORTHODONTIA FOR THE POOR\*

BY ELIZABETH E. RICHARDSON, D.D.S., SAN FRANCISCO, CALIF.

IN presenting this paper, it is my desire to impress upon you the great good that can be accomplished in clinic work, and it gives me more pleasure than I shall be able to express, to have been given this subject; as every day in my work there is brought home to me the vital need of impressing upon the minds of those engaged in our profession the necessity of cooperation with the medical profession, and this can be accomplished nowhere so well as it can be in a clinic. You are all aware of the extreme types of malocclusions of the teeth and facial deformities among the very poor. I discovered this fact in visiting the free medical clinics for poor children, and realized the benefit that could be accomplished in the treatment of many of these cases.

In the past year it has been my privilege to organize two orthodontic clinics in children's hospitals, and with the assistance of two orthodontists, about thirty-five children are receiving orthodontic treatment. The parents of these children are financially unable to pay the regular fee of an orthodontist. Some of them pay from two to five dollars monthly for treatment, but many of them receive free treatment. A social record is taken of each patient before being received as a member of the hospital and only the needy are admitted.

A complete record is taken of each patient's physical condition by the attending physicians, and placed on file in the office for future reference. These charts furnish us with a clear understanding of each case, which is of much value to us, and in many of the cases the physicians watch, with keen interest, the benefit derived from orthodontic treatment.

Our clinics are self-supporting, the orthodontists giving their services. We are provided with a room as are the medical clinics, and a waiting room in common for all the patients, with a nurse in attendance whose duty it is to take the names of all those who come for treatment in the different clinics, and we are each given a list of the names in order. We also have an assistant in the office who takes care of the list of names, so that each patient is waited on in turn. The operating room is equipped with a regular outfit necessary to carry on our work with comfort and convenience, and I am glad to report that the patients keep their appointments and seem to appreciate the work that is being done for them.

A few hours one morning each week is all the time required to give to each clinic, and it gives one a satisfaction that is truly worth the sacrifice of time and energy, as it takes care of the many poor suffering little children who would otherwise be neglected, not, mind you, through lack of interest of the parents, but through want of means.

It is my firm belief that in any profession, one's own progress or success in

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\*Read before the Alumni Society of the Dewey School of Orthodontia, Chicago, Ill., July 30-31, 1918.

life is aided by one's interest in humanity. What greater good, I ask you, can be accomplished than to devote a few hours each week in administering to the poor undeveloped ill-nourished children whose future career may depend upon the correction of mouth breathing, malformed arches, and malocclusions of the teeth?

The esthetic appearance is also of much importance, and it no doubt is of great value for the future success of the individual, as it may handicap him in obtaining his chosen occupation. Think of the importance of this phase alone. Does it not seem almost imperative that these children should receive our help? By establishing normal breathing and better mastication, we can, I believe, add fifty per cent to the child's fighting chance in life, thereby giving him more resistance to combat disease.

Clinic work in children's hospitals reaches the masses, it brings our work before the medical men, especially the rhinologists, and with their cooperation we can prove to them conclusively that our work is of the greatest benefit both mentally and physically to the individual.

I could cite case after case of extremely nervous patients who have been treated and greatly benefited in our clinics, but as you are all familiar with the gratifying results of orthodontic treatment, it is not necessary to mention them here.

Many of you no doubt are giving your valuable time and services in office hours, to worthy cases. The steadily rising standard of our profession is no longer adequate to meet the many demands made upon it by many of the patients mentioned. Is it not better to give a few hours one morning each week to care for a number of cases that would never come under your observation were it not with your connection with a children's hospital clinic? Also by your connections with these hospitals the medical men soon learn the value of orthodontic treatment to those who are in need of it, and is it not gratifying to have the hearty support and acknowledgment of the medical profession of the value of our services to these patients? Is there a better or surer way in which the results of our work can be made manifest? I leave this with you for your consideration, friends, and I feel that you will conclude with me that there is no better way, as it will form permanent pathways of response to the greater and better things in life.

## DISCUSSION ON THE PAPERS OF DR. E. E. RICHARDSON AND DR. F. A. FLETT

*Dr. George F. Burke, Detroit, Michigan.*—It is very gratifying to have the essayist credit me with the establishment of an orthodontic clinic for those unable to pay. While I am willing to assume responsibility for the suggestion, the credit for actually installing this clinic really belongs to the Detroit Board of Health. At the time this question of putting in this clinic was up for consideration, the oral hygiene committee of our local dental society was very active; it had both funds and a willingness to work, and splendid support was given to this movement.

The mouth hygiene work in Detroit has apparently won for itself a very secure place. The various women's clubs, the poor people and the people of means all support this work. Since this movement was first started some six or seven years ago the people generally have had the feeling that funds spent for the purpose of educating people in this field were well expended. The activities along this line not only cover the orthodontic clinic, but provision is made for systematic inspection by dentists of the children in both the parochial, and public schools. In addition there have been established a number of dental clinics that take care of those unable to pay. A recent report covering the school year just closed shows that about forty thousand visits were paid to those clinics, about two thirds of which were from old patients, and the remaining one third were new patients.

Detroit in some respects has approached this subject along advanced lines. Especially is this true in the matter of inspection, as our mouth examinations are made by trained dentists. In some localities this is done by school physicians, which is bad practice. Where this work is done by medical men they mistake permanent molars for temporary teeth. They overlook so many of the alveolar abscesses, so much caries, and have so poor an understanding of occlusion, that they never detect much malocclusion which should be treated in early childhood. In short, mouth examinations should be made only by those who have a thorough knowledge of dental anatomy and pathology, therefore accurate work in this field requires the service of a dentist.

The essayist has spoken of the orthodontic clinic conducted by the Health Board and intended for the patients unable to pay. From time to time I have observed the progress of this work. It is surprising to see what splendid results have been accomplished. A great many people believe that in order to get satisfactory results in this work that it is necessary to have a highly intelligent parent back of the patient in each case. The visiting nurses through their visits, and follow-up calls, tend in a considerable degree to offset the indifference and ignorance on the part of the parents.

It has seemed to me that teachers and nurses referred those pupils to the orthodontic clinic whose cases seemed to be most in need of treatment, and whose scholarship was good. The appreciation on the part of these parents for services rendered is genuine. And, as many of the cases treated are extreme, and as the people receive this service free, the mothers of these children are very generous in their expression of gratitude.

Two teachers in the employ of the Detroit Board of Education, who devote their time to those children having defective speech, were responsible to a considerable degree for the starting of this clinic. They held to the idea that in some instances the faulty speech of the children in their charge was due to malocclusion of their teeth. The splendid improvement that has followed the treatment of some of these cases shows that they were justified by their opinion.

When our work in mouth hygiene was first started several years ago, the local dental society, composed of a membership of four hundred, donated a sum of three hundred dollars for the purpose of aiding in the effort to start our work. This money was used both in having prepared five hundred petitions, and in mailing educational matter to the members of the Common Council and Board of Estimates. Visits were paid to the editorial offices of various city papers, and their support was received. Especially were the newspaper managers eager to lend their aid when they saw that many of our petitions were headed by the large merchants in the city.

The annual appropriation for mouth hygiene in Detroit has risen from five thousand to twenty-five thousand in the period of six years. Children are caring for their teeth much better than ever before. Green stains on front teeth, broken incisors and odontalgia

are not so common in Detroit and the school children are taking much greater pride in their personal appearance. Mouth hygiene will do for the dental profession, what preventive medicine has done for the medical profession—place it on a higher and more useful plane.

*Dr. T. E. Purcell, Kansas City, Missouri.*—The subjects which have been discussed in these papers appeal to me as being a very important phase of our work, particularly the education of the laity as to what our members are doing in the various orthodontic clinics throughout the country, and the methods by which the public is reached.

We should recognize the fact, as professional men, that this is a matter about which sociologists are talking so much nowadays—namely, uplift work or preventive charity which must be paid for by the general public. If the public does not pay for the work which is being done in clinics, they will pay for it in the institutions of reform, the poorhouses and the hospitals for the poor, which are maintained by the public. According to sociologists, the work which has been outlined here by the authors of these papers, should be considered in the light of preventive charity which is the ideal charity. We might give our time and attention to a certain class of people in doing work for them of this kind without compensation, and by so doing, we may do the individual good, yet at the same time we might be doing society harm, and that feature of this subject should be realized. The benefactor may be actuated by the highest motive and the recipient benefited by an act of charity, but society will doubtless be harmed through that individual. For instance, I may give a poor man a dime to buy food, but if he finds it easy to get the ten cents, he may decide not to work and become a pan-handler. Therefore, society had been injured although the individual has been benefited and the dispenser of the charity has exercised real charity. If we give our time and attention to the treatment of these cases with a view of bettering their condition, it is much better for these patients to pay something than for us to do the work for them free.

I wish those of you who are present and have heard these papers will give us your opinions and your experiences for the benefit of others here. There are many dental practitioners who are engaged in this work, and who have had experiences which will be of benefit to all. I hope it will not be necessary to call on any particular one but that you will each volunteer to speak on this interesting theme, and I know the members of the Society will want to hear from Dr. Dewey. Dr. Dewey has studied this subject in his visits from coast to coast and therefore can give us some good suggestions.

*Dr. Martin Dewey, Chicago.*—My experience with orthodontic clinics has been in several different clinics, and as Dr. Richardson and Dr. Flett have said, this is a subject of vital interest to the dental profession, and in my visits to different clinics I have observed many of the different things they have mentioned.

There can be no question as to the value of orthodontic services to the community as a whole, but there are certain individuals who are better able to take care of themselves and who can afford to pay nominal fees for the services rendered. The trouble with orthodontic service in times past has been that those people who know about orthodontia have sought the services of an orthodontist because of the esthetic side. A mother, for instance, brings her daughter to us for the purpose of having her teeth straightened as she wants the child's appearance improved. In other cases there may be less facial deformity, but more malocclusion, and we may spend hours in talking to such a patient and yet fail to convince the parents that the condition or conditions should be treated. In public clinics a good deal can be done to increase masticating efficiency; in some we get spectacular results by treating cases of facial deformities, but they often are the ones who leave before treatment is completed; which does not enable us to build a system of records.

The system Dr. Flett outlined is valuable and we should have enough data accumulated so that we can go before a medical board, a hospital, or medical college and show the advantages of our work, which would lighten our burdens, but whatever plan is pursued, I think the orthodontic clinic should not be an absolute charity. My experience with these clinics has been that before the work is started, if the patient is not compelled to pay a fee you hardly ever get the case finished and unless the case is finished your records will be useless and you will not achieve the object you are striving for.

Another side which the dental profession as a whole fails to realize in connection with these clinics is the benefit to the individual in charge, the man who works in the clinic. Medical men spend years of time in hospital clinics and giving their services absolutely free. Dentists as a class have never realized the full value of the knowledge they gain and the skill they acquire by working in clinics. In this respect the knowledge they gain from

coming in contact with clinical cases is invaluable, and in many instances they will encounter a class of cases presenting pathologic conditions and abnormalities that are not met with in daily practice. Such experience will broaden them and do them a great amount of good professionally.

From a purely selfish standpoint, I think the dental profession and orthodontists should pay more attention to clinical work because they have a chance to learn, and there is probably nothing that will advertise a professional man so much and give him standing in the profession and help him to reach the people who are not educated in other lines as doing clinical work.

While we are liable to think that people associated with orthodontic clinics and giving their services free for the time being are making great sacrifices, yet it pays them in the end from a purely selfish standpoint. I mention these things because my experience and observations in so-called "dental clinics" have been that the members of the dental profession take a wrong attitude towards them. They think of giving something without any return. As a matter of fact, the services given at clinics will be one of the biggest returns and one of the biggest rewards you can get. There is an old biblical saying that "bread cast upon the waters will return to you," and that is true of orthodontic and dental clinics.

The question of the public press has been mentioned. There is no question that the public press is a valuable adjunct, and probably any kind of article in the public press will do some good, but other articles, unless written by competent persons, will do lots of harm. Dental articles in the public press should be censored or edited by dental men before they are published. I recall an article written for the public press by a prominent medical man who should know better, but who made a great mistake in saying all of the permanent teeth erupt after the deciduous teeth are lost. Had a dental man edited such an article or censored it this would not have happened.

What the best method of organizing orthodontic clinics is I do not know. That will depend upon conditions, whether they should be under the control of the Board of Health, or whether they should be connected with large hospitals of the city. Probably there are two sides to the question. Both are correct, and they should be in both places, but, it seems to me, the trouble with anything under the control of the Board of Health is that it is apt to be a mere political proposition and would be more or less unsatisfactory. An orthodontic clinic to be the success that we want it to be should be such as to enable us to get records. Such a clinic must not be under the control of politicians, and the man who takes charge of the clinic should have a permanent position and not be governed by changes in politics. Let us take other departments of the Board of Health, like sanitation, public school inspection, and things like that, a man finishes his work as he goes along. If after working a year and becoming accustomed to the work he has to give up his job as a result of a change in administration, it is a great hindrance to good scientific work.

As to clinics in our large hospitals, where the positions of the men in those hospitals are more or less permanent, I believe under proper medical administration these clinics will be more of a success.

Then again, we must impress upon the public that the correction of malocclusions is a sociologic problem. To a certain extent the dental profession has been expected to carry on these clinics unaided. If some plan can be pursued to interest the people with philanthropic tendencies to make donations and establish orthodontic clinics, it would be much easier, for these things belong to the public, and the people will have to be educated to the importance of orthodontia for the poor. The only way to impress the people is by the establishment of a few clinics and the accumulation of records showing the excellent results obtained, which will prove the work is beneficial and essential and not a fad.

*Dr. Richardson.*—I have nothing more to say except that I think it is a great advantage to be in a children's hospital clinic. If you have the support of the profession it is a great help, and there is usually a dentist in the same hospital who will refer all cases to the orthodontist before extracting, which is also helpful.

*Dr. Flett.*—In regard to the Board of Health it depends upon the supervisor you have. I supervise my own department. We have a dental supervisor for the whole department, but he allows me to do just as I see fit. If you had a supervisor who wanted to run the department without consulting you in any way, you would not work very well.

We had a local medical clinic a short time ago and a rhinologist showed me some of the cases that he had operated on, and he asked to see a few of my patients. I consented and went along with him. It was pitiable to see what little knowledge that medical man had with reference to orthodontia. He knew nothing about it whatever. He asked me the most

ridiculous questions, and although we do not expect medical men to be right up to the minute on orthodontia, yet we expect them to have a better knowledge than most of them have. By conducting these clinics we will get orthodontia presented to the people in the proper way.

I would like to show you some models of cases of stammering which have improved considerably after treatment.

This case was a boy, 16 years of age, who stammered. He was sent to a school for stammerers, but was not benefited very much until we put on an orthodontic appliance. He was under treatment for two years. This is the case (See Figs. 1 to 4) after two years' treatment. The case is not completed, but the boy has been discharged from the stammering school. He talks now without any difficulty whatever.



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.

## WHEN IS THE IDEAL TIME TO CORRECT MALOCCLUSIONS\*

BY SIDNEY W. BRADLEY, M.D., D.D.S., OTTAWA, CANADA.

THE reason for my attempting this paper is that the teaching we have followed I think is, at least, a bit misleading. Let me quote from Angle's *Malocclusion of the Teeth*, 7th edition, page 311:

"The author is more and more impressed with the advantages of beginning the treatment early, *just as soon as malocclusion is manifest*. Then Nature is putting forth her best efforts; then growth and repair are most rapid and the surrounding tissues most yielding; then slight force is sufficient to gently direct each erupting tooth into its correct relation with the line of occlusion. Unless some unusual physical conditions of the patient exist, it is unquestionably a serious mistake, without the least argument in its favor, to defer the operation until all the teeth shall have erupted, a time-honored custom still often advocated and followed by dentists."

*Dental Cosmos*, September, 1916, page 971: "Another important point should also here again be emphasized, namely, that children with developing malocclusion, *which is always progressive*, should not be put off on one pretext or another until they have reached the age of fifteen years, or until malocclusion and maldevelopment shall have about reached their maximum, but that treatment should be begun promptly as early as it is manifestly required, even in the deciduous denture, for at this early period is undoubtedly offered our greatest opportunity for the ultimate establishment of normal development and function of the permanent denture and all its associated parts." But notice Angle's views in this sentence: "Yet I would at the same time also emphasize that the needless interference with child dentures, now so often done, can not be too strongly condemned."

Pullen in Johnson's text book of *Operative Dentistry*, edition of 1908, page 606, says: "Any arrested or deficient development of the arches of teeth may be diagnosed in advance of the permanent dentition, and should be stimulated to normal growth and development as early as the age of the patient will allow the wearing of delicate arches and bands for the purpose."

"Except for mesial or distal occlusion of the deciduous arches of teeth, the arrested lateral development of the arch is a condition most commonly demanding interference by the orthodontist."

"The lack of mesial and distal spacing between the deciduous incisors and cuspids at about five or six years of age is a very certain indication of a lack of anterior development sufficient for the proper eruption of the permanent teeth succeeding them."

"If the deciduous arch needs widening, it is better to perform this operation some little time before the roots of the deciduous molars have begun to absorb, since the crowns of the permanent bicuspids are enclosed within the

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roots of the deciduous molars, and the result of the expansion will be to move the crowns of these permanent teeth as well as the deciduous teeth and surrounding alveolar tissues into a larger arc, at the same time affording a gentle stimulus to the normal development of the arch.

If treatment is delayed until just before the time for shedding of the deciduous first molars, the roots of these teeth being almost absorbed, can afford no resistance to the appliance in expansion, and the crown will be shed before any expansion can be accomplished in this region, which will then delay the widening of the arch in this region until the permanent bicuspid are fully erupted, there being no other means of anchorage in the meantime, except what may be possibly obtained through the ligation of the deciduous cuspid, which many times is prematurely shed.

"The author has obtained the best results in arch development between the ages of six and eight years, and in some cases still younger, especially where a mesial or distal occlusion seemed inevitable.

"It is reasonable to suppose, from the rapidity of development of the alveolar process during the primary stages of eruption of the permanent teeth, that the movement of the deciduous teeth some little time previous to the period when absorption of the roots of deciduous cuspids and molars is about to be initiated, conforms most nearly to a natural and physiologic process, and that the amount of absorption of alveolar process in advance of moving teeth is comparatively slight, the change in these structures being analogous to the natural developmental changes which would occur in case no arrest of development had been observed."

Vernon Fisk, *Oral Health*, April, 1918: "If, at five or six years of age, the natural spaces have not appeared between the temporary teeth, the larger permanent ones which begin to appear about this time, will not have sufficient space to erupt evenly, and will be crowded. Irregularities of the teeth and malformations of the jaws often become manifest before a child is six years of age. As the bones in which the roots of the teeth are implanted are less dense in young children, operative procedure for the correction of lack of development and malformation of the jaws should be undertaken and completed, if possible, *before the permanent teeth appear*. By spreading the temporary teeth early, the crowns of the permanent ones which are held by the roots of the temporary teeth are drawn into positions which nature intended they should occupy. In this way irregularities may be prevented which would otherwise be inevitable and the benefits accruing from an entirely efficient masticating apparatus will be of great importance. Often parents are advised to wait until the permanent teeth have all come in before commencing treatment, thus increasing the deformity and making more difficult its correction. The earlier nature is assisted in establishing normal development, the greater will be the certainty of the teeth remaining in the positions in which they are placed. *The correction can not be commenced too soon*. If other bones of a child's body are malformed, would you wait until the child becomes a man almost before making an effort to have the deformity corrected? Certainly not. Then why wait if the bones of its face are malformed? The dentist who will not make an effort to correct these



conditions early, or refer you to one who will, is not doing his duty. Irregularities of the teeth affect the health, appearance and prosperity of the individual, therefore, if your child's teeth are crowded, consult your dentist, or if possible, an orthodontist now."

Dewey says: "There are so many conditions to take into consideration, but in a general way, malocclusions should be corrected as soon as they are present."

Lischer comes nearer a definite understanding when he says in *Orthodontics*, page 138: "The recent experiences of many practitioners have led us to a keener appreciation of the 'golden age for treatment,' by which we mean that time in an individual's life when the change from the temporary to permanent dentition takes place. This covers the period from the sixth to the fourteenth year. In rare instances (those cases which early exhibit a tendency toward extreme malformation of the jaws) it has been found advisable to begin treatment prior to the sixth year. And in most cases of mesiocclusion or distocclusion, it is best to institute treatment as soon as it can be diagnosed, i. e., immediately after the eruption of the four first permanent molars.

"The establishment of the alveoli and the complete calcification of the roots of the teeth; the development of the temporomandibular articulation; the lengthening of the rami and the development of the body of the mandible—all these are considerations which must be reckoned with.

"Page 143, To the question then, Is early treatment always advisable? the uniform reply is Yes. Should postponement of treatment be desirable in a given case, the operator should be accorded the privilege of the decision."

These opinions I believe are not definite enough and advise too much early interference, although Angle advises against the "needless interference with the child dentures, now so often done."

To know when the proper time has arrived to begin correcting a case of malocclusion is the most important part of the work, equally as important as retention, for if begun at the proper time retention will be an easy problem.

Unfortunately for us younger orthodontists there has been too much advice along the lines of early interference. This is no doubt due to the very early and misleading advice: to let all the permanent teeth erupt before commencing their correction. The pendulum of progress swung too far in the direction of late interference; now we have it swinging too far in the opposite direction. What we want is a sane intermediary balance; that teaching which will apply to perhaps 95 per cent of the cases we are called upon to treat.

Let us give Nature a chance. Don't be in too great a hurry to start a case, but keep it under survey until you think the ideal time has arrived. Have the little patient report every five or six months to see if Nature is doing her work, or the ideal time for assisting nature has arrived. Of course if we leave a case till the patient is too old we deserve as much censure as for starting it too soon. There are enough cases left for "Nature to do the work" where it is impossible for Nature to act unless she is assisted in her efforts.

Because a child's deciduous denture is not well developed at six and one-half years does not mean that at seven or seven and one-half years it will still be underdeveloped; natural conditions may so change during this interval that the

mandibular and maxillary arches may develop to normal proportions. You have corrected cases of underdeveloped dentures in patients of eleven years whose facial expression when you were finished was that of being "all teeth," or as one patient expressed it to me, "when Miss H. smiles there is a rush of teeth to her face." The same case, a year, or a year and a half later, may be altogether different; the facial bones and the whole system have developed to such a degree that the jaws and teeth are in harmonious relation to the surrounding tissues. If Nature should fail in her efforts at eight, or nine, or ten years of age, to produce a normal denture is the patient much inconvenienced, and can we not get as good permanent results at eleven years as by beginning three years sooner? By too early guiding the teeth into normal occlusion we have a term of treatment covering from five to seven years and in how many cases have you, after making a retainer which should, if it worked according to Hoyle, cause the permanent bicuspid to erupt buccally, whereas they erupted with the lingual cusps to the lingual of the retaining bar and you had to adjust your retainer to move those teeth buccally.

In those cases of severe malocclusion which may interfere with the youngster's ability to masticate its food or breathe properly or affect its general health in any way, then we can not start too early, but remember you are not through with those cases until all the permanent teeth anterior to the first permanent molars are in proper occlusion, and that may mean a case extending through a period of six years or even longer. Sometimes too we have to guide the second permanent molars which erupt at about twelve years into normal occlusion.

Let us remember that the less complicated, the fewer, and the shorter time appliances are on our patients' teeth the better for them, and us too. We must not do anything which will destroy the enamel or the soft tissues surrounding the teeth. We know how difficult it is to keep patients' teeth absolutely clean and to prevent decalcification of the enamel unless the alignment arch lies against a metallic covered enamel surface. We know the evil results of ill-fitting bands, plain or clamp, which do not correctly follow the gingival gum margin. We must remember that the enamel surfaces of the teeth are not improved with metallic bands cemented over them for long periods. Then why should we keep appliances, either active or passive, on any longer than is absolutely necessary?

Now when is the ideal time to correct a malocclusion in the vast majority of cases? Is it at eight or nine or ten or eleven years of age? We can not give the time in calendar years, for one child at nine and one-half years old may have its permanent teeth erupted to the same degree as another child at eleven or even a little older. In my opinion the ideal time to begin, is when the first bicuspid in both upper and lower arches have erupted just far enough to place narrow bands on them, if this be necessary, whatever the age may be. They can then be guided into correct positions easily and will remain where placed. With their eruption the cuspid are likely ready to erupt or indeed may have come through.

When we get cases similar to those described, how many of us are sorry we did not get them sooner? Most of us are sincerely thankful we are not

obliged to perform nursery stunts as well as correct the malocclusion. No matter how difficult the case, you feel satisfied you can finish it in a satisfactory manner and bring about normal occlusion without taking too much time. The child is old enough, too, to follow your instructions more faithfully than a younger patient.

Some may claim, and rightly too, that those cases of older patients require longer retention. Granted that they do, I would much rather take care of retainers on a child of twelve or thirteen than on a younger one.

With a condition approximating what I have described you can expand the arches, move them into normal mesiodistal relation, correct infra- or supra-occlusion, bring about nice facial development and when you have finished after fifteen to twenty months' time and placed a neat retainer you are not worried about what the teeth that are to erupt are going to do. You have them in their place now and in time for the natural development of the child to build up the structures surrounding them. The cusps of the teeth present are interlocking and with physiologic conditions as to respiratory passages, muscular action and all the conditions necessary to maintain normal occlusion, your case is finished.

#### DISCUSSION

*Dr. T. E. Purcell, Kansas City.*—You have heard this excellent paper on a subject that ought to bring out a good and free discussion. I am sure that some of you will agree and others will disagree with the essayist in some respects. I think it is unfortunate that we have not had some one selected to open the discussion and be familiar with the paper.

*Dr. O. H. McCarty, Tulsa, Oklahoma.*—I know Dr. Bradley well enough to disagree with him, and know it will not hurt him a bit, but there was one thing touched on in the paper that I want to bring out in the discussion, as forcibly as possible for my own benefit. Dr. Bradley disagrees with the early treatment in mesio- and distocclusion cases. I have only been doing this work about three years, but I find we can take a child three or four years of age and within a short time correct a mesiocclusion or a distocclusion with very good results. I have not had the time yet to know whether it will remain that way.

*Dr. T. E. Purcell.*—This matter of the second and third class of malocclusions is an important one. There is a good deal of room for discussion on that phase of the paper.

*Dr. Walter S. Sargant, Toledo, Ohio.*—I think a case of mesiocclusion should be treated as young as the patients will permit the orthodontist to work on them, thus preventing overdevelopment of the mandible; but in cases of distocclusion I have much more satisfactory results treating them after the first permanent molars are in place to aid in retention. In many cases the interlocking of the cusps of the deciduous teeth is not sufficient to hold normal occlusion after it has been established and retained for a considerable time. The corrected arch relation may stay for several months, then it will begin to slip back to its former position.

We also find a large number of broken-down deciduous teeth in which the restoration furnishes no interlocking of the cusps to aid in maintaining normal occlusion.

I should like to know what the experience of others has been as to the position of bicuspid in patients where the deciduous arch has been expanded considerably. In my experience I find them often rotated, in fact so frequently that I thought the expanding of the deciduous arch had something to do with it.

With this in mind, I have found it advisable to make it clear to parents that when I take a case of this kind, further treatment may be necessary when the bicuspid erupt.

*Dr. Charles R. Baker, Evanston, Illinois.*—I am not a member of your Society but am glad to have this opportunity to hear your interesting papers. I have not much to say in discussing Dr. Bradley's paper except that personally, I am in favor of correcting

irregularities of the teeth as soon as it can practically be accomplished. As long as there is abnormal development of the jaws due to abnormally located teeth these abnormal conditions will interfere with a normal development of the rest of the face, particularly the adjoining tissues. If the patient has an unusually narrow upper arch, it is but natural to expect this condition to affect the development of the tissues connected with the upper jaw. If the orthodontic treatment is deferred, the result, both as to occlusion and harmony of the face will not be as good as if early treatment were given. I think we should guide the erupting teeth into their proper positions instead of allowing them to erupt abnormally and correct them later. If we help the teeth to erupt normally, the teeth are easier to move than later, on account of the smaller amount of root development and because they do not need to be moved through dense alveolar process that develops rapidly around the roots. I would not wait until the first bicuspid erupted before widening an arch, for if the anterior teeth are crowded and irregular, they should be placed in normal positions as soon as possible, during the period when growth of the tissues in that region is rapid. The widening, or moving buccally, of the deciduous molars usually carries the bicuspid along. I have had a number of cases in which there was mesiocclusion in the deciduous dentures and have treated these little patients at the age of three or three and a half years, a favorable time, due to the fact that the roots of all of the deciduous teeth are usually fully developed at this time, and the later results when the permanent teeth erupted have been gratifying; the development of the face normal.

The reason that the jaws seem too large for the face after having been expanded, as Dr. Bradley stated, is probably because the jaws were much too small previously and this fact had prevented the normal development of the upper part of the face. If the jaw are enlarged soon enough, at the time of rapid development of the tissues of the face, the final result will be a harmonious face.

The essayist suggested that some cases be examined at intervals of six months pending treatment. If cases are to be examined from time to time, the intervals between examinations should not be as long as six months; three months is sufficient, for in six months I have seen a number of cases change from simple to complicated malocclusion.

*Dr. John W. Kirby, Chicago.*—I should like to add a word in regard to the early treatment of cases of malocclusion. As I understood the essayist, he referred to all cases in general, and my remarks will have reference particularly to the cases where extraction of the deciduous teeth has taken place. In my general practice, I see hundreds of cases of extraction of baby teeth that many people think ought to be extracted, and if the treatment of these cases of malocclusion was left until the premolars came in, it seems to me it would be altogether too late. I do not mean altogether too late, but we have oftentimes devoted a lot of extra work to the treatment that would not have been necessary if the child had been taken early. That is one point I would like to make and emphasize.

*Dr. A. C. Gifford, Oshkosh, Wisconsin.*—In speaking of the ideal time for treatment, I will say that cases differ so much in tooth eruption that I do not really believe there is an ideal time for treatment. You can not set any particular or definite time for treatment. The ideal time for treatment, I agree with Dr. Bradley, is when the premolars have erupted enough to permit bands to be adjusted or before the roots of the temporary teeth have been absorbed. That would be two separate times for treatment, so you could not exactly say there was any ideal time for treatment in my estimation. Conditions in different cases vary. Development is different in some patients.

I have had the same experience that Dr. Bradley has had in moving temporary teeth and finding when the premolars had erupted they were straddling my wire retention. It made more treatment and very often lengthens our process to take the case at the time the temporary teeth are about to be lost.

*Dr. Max C. Ernst, St. Paul, Minnesota.*—I would like to bring up one point in connection with this discussion. Dr. Morison of St. Paul has done a great deal of work and study along the lines of occlusion and formerly did a great deal of orthodontia. He claims to have had some remarkable results by instituting a proper system of diet and improving function in these cases where there was a lack of development at the age of six to eight or nine, or even older in the permanent set of teeth. He says he has had some excellent results from this plan. There would seem to be some chance to look into the diet and into the functional end of our work in order to get the teeth to functionate properly and thereby get greater development of the tissues surrounding the teeth.

*Dr. Martin Dewey, Chicago.*—It is rather an unkind thing to ask a man to read a paper and then disagree with him in nearly everything he has said. I will admit that Dr. Bradley has set forth the reasons very clearly for writing this paper, for too much has been written regarding the early treatment in a general way, and the difficulty comes, of course, in trying to select the same time for all cases.

The other day I received a letter from a man who has written a great many papers on early treatment. He claimed that any case of malocclusion could be diagnosed from the deciduous set of teeth, about five and a half years of age, and all deciduous arches should be expanded according to the judgment of this man. Such advice as that is absolutely wrong because you can not always tell the proper development of the arches at five and a half years of age as Dr. Bradley says. There has been too much interference with deciduous arches without giving nature a chance. Deciduous arches are not the only things in cases of malocclusion indicating lack of development or lack of space. On the other hand, if you have abnormal cusp relation of the teeth and it is mesio- or distoclusal, it can not be corrected too early, even at three and a half, four, or five years of age. The correction of the distal or mesial occlusion will have an effect upon the permanent teeth and help get them in proper occlusion, that does not mean there will be no other malocclusion. Because you correct the distal occlusion in the deciduous teeth it does not necessarily mean you would not have neutroclusion of the permanent teeth. Because a man had typhoid fever years ago is no sign that he will not have pneumonia next year. The etiologic factors of malocclusion should be taken into consideration. You may be certain in a case of mesio- or distoclusion of the deciduous arch and in any case where the cusp relation is abnormal, regardless of the age of the patient that it should be corrected. To go the other way and put the eruption of the premolars as the basis for beginning treatment is quite wrong because a great many cases of malocclusion are absolutely dismissed and finished before the premolars ever erupt. I know that there is a tendency not to treat the deciduous arches, a tendency against subjecting small or young patients to treatment by putting on orthodontic appliances. When properly constructed, an orthodontic appliance should not cause pain or inconvenience to the patient. Pain can be absolutely eliminated. I am against the treatment of deciduous arches for the only purpose of developing those arches when no actual malocclusion is present; because the permanent tooth germs have to unfold themselves during the process of eruption and when the permanent teeth begin to erupt the deciduous arch may develop as it should. We have altogether too much needless interference with deciduous arches, for you can wait until the first permanent tooth makes its appearance. If it has not room at that time the arch can be expanded and you can expand the arch in the canine and deciduous molar region and make room for the incisors and from that time on a great many of these cases will not need any other attention. You have started development and nature may keep it up. If you wait until the premolars erupt you have that many more teeth to move. You must realize in some of these cases that you expand the deciduous arch to make room for the deciduous incisors and it stops there and the premolars come into occlusion.

In producing the expansion of the arches, you increase the nasal space. This is another group of cases which must be begun early. Admitting the possibility that you may put an appliance on a deciduous arch or molars, and move the deciduous molars without expanding the premolars; that can be prevented if you can put in a roof plate which presses on the soft tissue or roof of the mouth, and by pressure from the roof plate, we develop the superior maxillary bones without exerting undue pressure on the deciduous teeth. I have seen cases treated with that appliance, deciduous teeth carried out bodily, and from pressure on the soft tissue the arch develops and the nasal space widens. This work is along the line of orthopedic surgery for when straightening bones, legs and arms, pressure is brought to bear on the soft tissues and that fact to a certain extent has been forgotten in orthodontics. If a properly constructed plate is made, with the palatal portion divided in the center, the roof of the mouth can be widened and the premolar and crypts carried out and the deciduous arch moved without tipping. A similar plate can be used in the lower but it is not quite so necessary.

There are other things which enter into the question of what is the proper time for treatment. We have been taught or a great many people believe, that the first molar is the proper anchor tooth. I think the first molar at the age of six or seven as an anchor tooth should never be used. Much harm is done by placing anchorage on the first molars too early, and it is better to use the second deciduous molar. First molars

have been displaced at that age because of improper root development. Again, I repeat: we should be very careful in using the first molar for anchorage prior to the eruption of the second molar. There are a great many cases where the first molar loosens when used as an anchorage. In some cases it is more desirable to use the premolar or deciduous molar as an anchor tooth without having to disturb the first molar if the second molar is about to erupt. Some complications have arisen from the use of the first molar at the age of twelve.

The ideal time for treatment for cases will vary in each individual case. As a general rule, any case of malocclusion, regardless of the age of the patient, that has abnormal cusp relation, should be treated, it does not make any difference whether it is a deciduous or permanent dentition. Any bunching of the deciduous incisors should be treated promptly. It makes eruption of the permanent incisors easier and the arches have been widened, and this widening is all that is often needed because nature has caught up with herself by that time. Such cases as that would be finished long before the premolars came in. Of course, when you start that case you do not know when you will be through with it, and all you can promise the patient is that you will correct the existing malocclusion, and nothing further may be necessary, but something may be necessary in later years, and that will be another condition for treatment. Therefore, I think the advice as given by Dr. Bradley if accepted by the dental profession, will do an enormous amount of harm because the rank and file of the profession do not take the proper view, as he does.

I realize that probably there are a lot of cases, taken at the time of the eruption of the premolars, that can be finished in less time than if started early, but nevertheless cases started earlier will be finished at an earlier period as regards the age of the patient. The patient will begin normal development earlier in life and have a normal dental apparatus earlier than he would if the case was delayed until the premolars were erupted.

Another thing if the case is treated early in the life of the child there is more active growth. The tissues respond to mechanical stimulation more readily at the ages from five to nine than they do at fourteen or sixteen.

Another thing in favor of early treatment, even if you treat a case a little longer, if you have the patient under observation longer, you will give him a normal dental apparatus earlier in life than if you waited for the eruption of the premolars.

There is some danger in using a regulating appliance on the teeth the way some appliances are made, but with a properly constructed appliance, one constructed along hygienic lines, the danger is so slight that it is no disadvantage to the long treatment of the case.

Like a great many things, there are two sides to the question of early treatment. I have seen a great many cases treated in which treatment was not demanded at the time. On the other hand, I have seen cases where patients have been allowed to wait too long. Five or six months between consultation visits is too long. The time for the patient to come to the office is when there is likely to be eruption of the permanent incisors and torsion. The patient should come in every two or three months and not wait five or six months. As the result of certain conditions in each individual case, it may be desirable to wait a few months before you begin treatment, but to put it off a number of years, as a rule, is wrong because torsion of the permanent teeth should be corrected as soon as possible. Possibly that may be the end of the thing or it may not be, but you have done everything you can to bring about early normal development of the teeth as they go along.

*Dr. C. R. Lawrence, Enid, Oklahoma.*—What do you do in prolonged retention of the temporary teeth?

*Dr. Dewey.*—You probably refer to the deciduous molars. There are several plans. The first thing to do in prolonged retention of the deciduous molar is to have a radiograph to see what you have underneath. In some of these cases the teeth are slow in erupting, you will sometimes find malocclusion produced almost entirely by the time the upper and lower deciduous molars are lost. You may often find a condition where the deciduous second molars are retained too long. The upper deciduous molars have been lost; the upper teeth are in normal approximal contact; you have the distal relation of the lower molar to the upper. I think the second deciduous molars should be extracted, so that the permanent molars can be placed in their proper mesio-distal relations and locked normally.

Dr. Lourie, in his practice, has a number of these cases, or models of them, in

which he has reduced the mesio-distal diameter of the deciduous molars, uppers and lowers, to keep the first permanent molars in normal relations to each other.

I have a case under treatment now where the right lower arch is normal from the right canine around to the left lower molar. The right molar is distal because the deciduous molar is present. The whole relation on the right side is disturbed by the deciduous tooth. We have an appliance on the lower left first molar and lower right canine. The deciduous molar was extracted and we are waiting for the permanent molar to drift forward. You have to vary the time and treatment according to the condition that arises in each individual case, and the time suitable for one case will not be suitable for another. It is quite dangerous, I think, to take the eruption of the premolars as a guide for beginning the treatment because a large number of cases—yes, ninety per cent of them—can be finished before the premolars erupt. You get normal occlusion earlier in life.

*Dr. George F. Burke, Detroit, Michigan.*—There have been two children under treatment in my office both of whom were four years of age. One case was typical Class II, and the protrusion of the upper teeth was so marked that the lips were separated most of the time, resulting in much mouth breathing. In the other case the upper incisors erupted distally to the lower incisors, creating a condition whereby the maxilla could not develop normally, resulting in a condition whereby the cusps in mastication could not glide over each other in close contact, confining the patient to the chopping motion of the mandible.

I would like very much to ask Dr. Dewey, if in his opinion delay in the treatment of the cases, just described, would be justified. It appears to me that early treatment in such cases is greatly to be desired both from the standpoint of the health and the appearance of the patient.

*Dr. Dewey.*—Both of those cases should be treated immediately and come under the plan I outlined, because they both have abnormal cusp relations. Take any case of abnormal cusp relation and it should be started at once. These cases are both extreme. Take a case of extreme distal occlusion, if it is corrected and the deciduous arch is corrected properly the permanent molars will be absolutely normal.

A distoclusal case was treated and it relapsed. It relapsed because the treatment was never finished. The doctor who treated it established the cusp relation but he had too much overbite. If he had corrected the overbite and gained room for his molars the relapse would not have occurred. With a normal cusp relation you must have a proper overbite. An improper bite causes a great many of these cases to relapse. In the other cases, where the upper incisors are in lingual relation to the lower, you will not infrequently get mesial occlusion. The mandible will be overdeveloped. If you correct the relation of the incisors, there are ninety-five chances out of a hundred that you will never have any mesio-occlusion, so that in regard to a ruling to make for time to begin treatment; in any kind of abnormal cusp relation or a case of mesial or distal occlusion or extreme torsion, treatment should be begun at once. From a systemic standpoint, the constitutional effect seems to be purely a question of orthodontic procedure.

*Dr. Bradley (closing).*—If the members of our Society who thought as I did but were wise enough to leave their thoughts unexpressed, have benefited as much as I have by this splendid discussion, we have been well repaid indeed for attending this meeting. Dr. Dewey has expressed himself very clearly and definitely on this subject. I still claim the general teaching has been too abstract, but Dr. Dewey has given us concrete ideas on how very indefinite this problem is. I thought I had started many cases much too early, but I was expecting too definite results. Dr. Dewey says another malocclusion may develop after we have corrected one and we must of course correct this one too. I expected when I had corrected a malocclusion that everything should be well afterwards. It was expecting too much. As I said in my paper, the teaching of early interference is splendid but too general. We have obtained some definite concrete ideas to work on now. Of course it is far better to begin a case too early than leave it too late.

We members of the Dewey School have been practicing orthodontia thoughtfully and carefully such a short time that we can hardly express definite opinions. We must have open minds and learn from the experience of older men. I wish we had half a dozen men who had been practicing orthodontia ten or fifteen years who would discuss this feature of our work candidly, then we younger fellows would learn a great deal.

I thank you all for the interest you have shown in my effort and particularly Dr. Dewey for expressing such definite ideas which will be such a great help to us all I am sure.

# DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Under the Editorial Supervision of

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It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

## AN INTERESTING IMPACTION—INFORMATION WANTED

BY JAMES DAVID MCCOY, D.D.S., LOS ANGELES, CAL.

*Professor of Orthodontia and Radiography, College of Dentistry, University of Southern California*

IN the October issue of the JOURNAL, there was presented by Dr. B. Frank Gray, of San Francisco, a very interesting case report entitled "A Study in Impactions—Information Wanted." His illustrations pictured conditions so unusual that few of us would care to suggest a method of treatment unless we had handled similar cases in practices. See Figs. 1 and 2.

If such unusual and complicated cases are treated at all it seems to me the first requisite for their successful culmination would be an exceedingly strong desire on the part of the patient to have the work done, for any method employed must of necessity be rather heroic.

Personally if such a complicated case occurred in my own practice and was unaccompanied by pathologic symptoms and the patient *was not anxious to have the work done*, "I would let sleeping dogs lie." On the other hand, if I were convinced that it was essential to the best interests of the patient to proceed, I should most certainly follow Dr. Gray's suggestion and work in conjunction with the oral surgeon.

A somewhat similar case has occurred in my own practice and is shown in Figs. 3, 4 and 5. The patient was just fourteen years of age and had erupted all of her teeth with the exception of the lower right second molar (and of course the third molars). There was considerable fullness in the region where the unerupted second molar should come through so that I did not deem it necessary to make a radiogram. That this was a grievous error in judgment is shown by Fig. 5. The radiogram was made after the case had been under treatment about a year, at which time the teeth in the mouth had been placed in their normal relations. Now, then, the question arises: What should be done? I have recommended the removal of the lower second molar, as an exodontist tells me it may be taken out through the buccal side of the process. With this tooth out of the way the third molar can come forward as it erupts



and can be later tilted back into very good occlusion. In the meantime the upper second molar is becoming elongated from the pressure of the developing upper third. In my judgment, the upper second molar should be removed to allow the third to come down and take its place.

Unfortunately (or perhaps fortunately) the parents of the patient have an extremely strong aversion to operations and will allow me to do nothing, there-



Fig. 1. (After B. Frank Gray.)



Fig. 2. (After B. Frank Gray.)

fore the case will have to remain as it is unless pathologic symptoms of a sufficiently alarming character occur so that the parents will change their attitude. If it were *your case* and you were not hampered by parental interference, *what would your procedure be?*



Fig. 3.



Fig. 4.

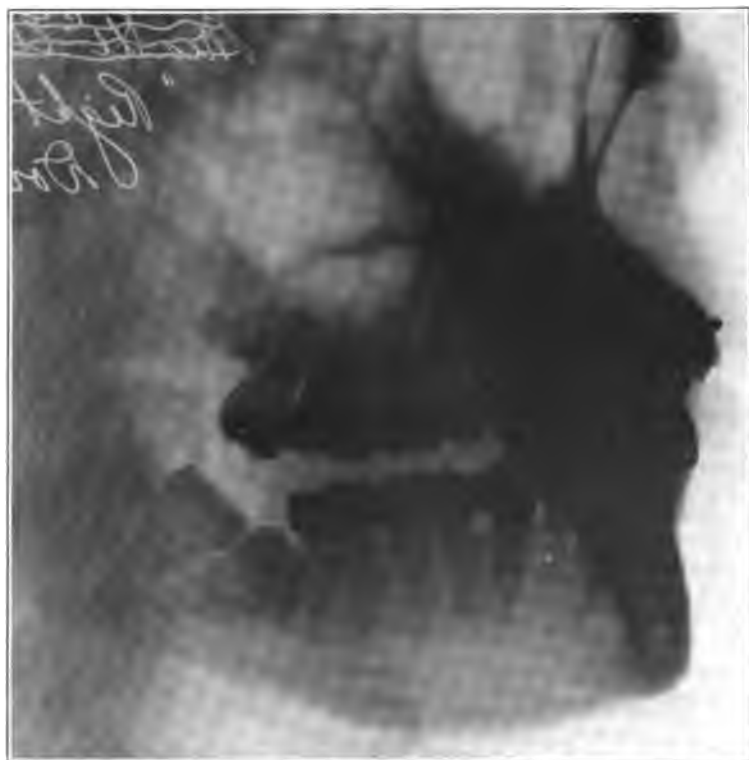


Fig. 5.

## PYORRHEA ALVEOLARIS\*

### IMPORTANCE OF PROPER FUNCTIONING OF THE JAWS—VINCENT'S DISEASE OF THE GUMS—WHAT CONSTITUTES A THOROUGH DENTAL EXAMINATION —ORAL HYGIENE DURING CHRONIC ILLNESS

BY W. F. DREA, D.M.D., COLORADO SPRINGS, COLO.

#### IMPORTANCE OF PROPER FUNCTIONING OF THE JAWS

THE usually adopted translation of Wolf's law of bone transformation is: "Every change in the form and function of a bone or of its function alone, is followed by certain definite changes in its internal architecture, and



Fig. 1.—Schema showing arrangement of roentgenograms, and record of data revealed by them for dental examination.

equally definite secondary alterations in its external conformation, in accordance with mathematical laws." Murphy more tersely expressed the law when he stated, "The amount of growth in a bone depends upon the need for it." In brief, a bone has the power of adapting itself to the burden it has to bear.

The osteoblasts are at all times building and unbuilding bone, according to the stress to which they are subjected. It is as necessary for their health that they be subjected to stress as it is that any body be exercised. It is the stress to which the osteoblasts are subjected that determines the form of a bone.

\*Reprinted by permission from *Colorado Medicine*, December, 1918. Read before the El Paso County Medical Society, June 12, 1918.

The foregoing statements enable us to appreciate more fully the necessity of giving the growing jaws plenty of resistance to overcome. When we consider how the muscles of mastication are attached and the great power that may be developed by these muscles when functioning, we realize there must be stress brought to bear upon the parts of the skull to which they are attached as well as upon the jaw. Wolf's law leads us to realize that as a result there must be reaction with the osteoblasts in the development of these



Fig. 2.



Fig. 3.

Fig. 2.—Man, age about 50 years, received severe blow on right jaw. Four weeks after, swelling and severe pain developed in lower jaw at an angle. Two weeks further elapsed before the patient was referred for a roentgenogram, which showed extensive destruction of bone, both in the body and in the ramus. The plate was also of great value in indicating the great care that must be used in the removal of the two posterior molars for drainage, lest fracture of the jaw should occur.

Two roots of an upper molar are also shown incidentally, embedded in the tissues.

Fig. 3.—Extraoral plates are also of great value when they indicate more than ordinary difficulty in the extracting of teeth. The above shows, besides the diseased condition of the root ends of the lower second bicuspid and first molar, the great density of the bone embracing them. Such teeth cannot be extracted without fracturing the roots. This latter fact is of increased importance when the patient is at the same time suffering from the ill effects of some systemic disease. Such teeth as these should be removed, but only after a flap of the overlying periosteum has been thrown back and the bone dissected away.

bones and in proportion as the muscle stresses are normal will this reaction be normal.

Baker experimented on rabbits by grinding down all the teeth on the right side of the lower jaw and the upper right central at the time of weaning.

As these ground teeth elongated, they were reground. At the end of seven months, one of these skulls showed a deviation of the bones to the left, the suture between the frontal and parietal bone not at right angles to the long axis of the skull, the right frontal bone projecting further forward than the left, a striking deviation in the nasal bones, both being twisted to the left, and the left zygomatic space longer and more advanced than the right space. The deviation extended throughout the skull. The lower jaw was also distorted even as to the size of the articular process. On the unused side, the muscles were atrophied. The skulls weighed less than those of the controls. These experiments were repeated on sheep and the same general results secured.

Thus, by experiment, was produced in the skull what might have been predicted from Wolf's law. Every suture and bone was altered.

Mosher noted that wherever there was a moderate and equal delay in the eruption of the upper central incisor teeth the premaxillary wings were symmetrically enlarged at the floor of the nose and there was no deviation of the septum. When, however, there was a marked inequality and delay in the eruption of one central incisor as compared with the other, then on the side of the backward tooth, the premaxillary wing was much enlarged or displaced and the quadrangular cartilage was tipped out of its bed along the vomer-ethmoid suture and as a result there was deviation of the septum. Here we have a localized deformity due to abnormal stress. Such a retardation of one tooth could have happened as a result of premature lancing of the gum overlying that particular tooth, the resulting scar tissue being too resistant for the erupting tooth to penetrate. It is well for this reason to warn against premature or insufficient lancing of the gums overlying erupting teeth.

From the above facts I think it is safe to conclude that it is important that the infant be required, when fed by means of the bottle, to exert the same force as when securing its nourishment from the breast. The nipple should be so formed that this is possible. During the mastication of food it is also important that the growing individual be required to overcome considerable resistance. Not only will the jaws be better developed and more room be secured for the eruption of teeth having stronger periodontal membranes, but the bones of the cranium and face will be better developed and more normal conditions will be secured for the important organs and chambers they bound. Foods that require the vigorous use of the muscles of mastication should be chosen. Proper functioning of the jaws and teeth is a necessary precedent to the well being of the teeth, of the jaws, and of the directly and indirectly related structures, and to the prevention of dental lesions that may come about as late as in adult life.

#### PYORRHEA ALVEOLARIS

This term is usually employed to designate all diseased conditions of the investing tissues of the teeth, and as such is a misnomer. A chronic suppurating condition of the periodontal membrane is more clearly described as "chronic suppurative pericementitis." Such a term as "pyorrhea alveolaris" is wrong because, for one reason, it is likely to mislead the patient, dentist, and phy-

sician. If there is failure to find pus, no such condition as that described by "pyorrhea alveolaris" is present. But there may be infection and chronic inflammation present that may be just as serious as, and in some cases terminate in, the suppurating condition described as pyorrhea. And because this nonsuppurative condition is not properly recognized and described, it is too frequently overlooked and dismissed from mind or not properly treated, both by the dental and the medical adviser. The result is that instead of arresting these pericemental troubles in their incipiency they are allowed to progress to a point where it is next to impossible or impossible to get rid of them without extracting the teeth. When the disease is limited to the gum tissue, it may be referred to as gingivitis or interstitial gingivitis. When this has progressed so far that there is involvement of the peridental membrane, without pus, it may fitly be described as pericementitis. When there is pus present in pericementitis and the condition is not chronic, we have the "acute suppurative pericementitis." Therefore, leading up to the chronic suppurating condition of the peridental membrane we have the following sequence: gingivitis or interstitial gingivitis, pericementitis, acute suppurative pericementitis, and chronic suppurative pericementitis. The more advanced cases are complicated by involvement of the cementum and of the alveolus.

In the majority of cases, with the probable exception of those where the fusiform bacilli and the spirochetes are concerned, it seems necessary for their occurrence that the gums and peridental tissues be in a state of lowered resistance. This state of lowered resistance may be the result of trauma from deposits of salivary calculus, irritating dental restorations, etc., or of certain systemic conditions such as diabetes, Bright's disease, scurvy, leucemia, pellagra, autointoxication, and pregnancy. Some of the acute diseases and the toxic action of certain drugs, such as mercury and iodine, also make it possible for the gums to easily become infected. Any condition leading to a constriction of the peripheral blood vessels of those tissues will bring about a lowered resistance to infection.

The organisms concerned are bacteria, amebæ, spirochetes, or a combination of these.

The proper treatment of these lesions of the gums and the peridental lesions will depend upon a consideration of the factors above stated.

Where local injury and bacterial infection are the factors concerned, removal of the cause and application of iodine to the diseased tissues will bring relief provided the peridental membrane has not been involved too much.

Where there is a predisposing systemic condition exerting its influence, it must be corrected or local treatment can only be palliative at the most. If amebæ are present in large numbers, emetine should be used. Many writers do not think that amebæ are to be seriously considered or that the emetine treatment has been successful. If the principles laid down by Smith and Barrett are closely followed, however, we feel certain greater success will be obtained by others. The cases must be properly selected, and fresh, properly prepared solutions of the drug used as directed. Where spirochetes are concerned, local treatment with arsenic in some form should be given. Of the spirochetal infections more will be said later.

Most of these cases are treated by scaling or planing the roots with the object of removing desposits of salivary or serum calculi and by applying anti-septics such as iodine. This is proper where there are deposits to be removed and the infection is bacterial only. But where there are no deposits or necrotic tissue to remove, where the predisposing cause is systemic, or where the amebæ or the spirochetes are the organisms principally concerned, this treatment is irrational. There is too much instrumentation in many cases and many times it is positively harmful instead of beneficial.

It is urged therefore that those cases not plainly due to local causes and



Fig. 4.



Fig. 5.

Fig. 4.—Patient had considerable swelling of neck in region of angle of lower left jaw. Lower molars appeared to be devitalized and were suspected of being septic. Extraoral plates showed calcified submaxillary gland and intraoral films showed that teeth were not involved.

Fig. 5.—The value of extraoral plates is well illustrated by the above cut. Both molars shown are impacted, and the lower molar was completely embedded in the tissues. By comparing the density of the shadow cast by the investing bone with that of the tooth it will be seen that the bone must be very dense. Such proved to be the case when the writer chiselled away the bone preparatory to removal of the lower molar.

bacterial infection be examined for the presence or absence of amebæ and spirochetes and that it also be determined whether or not an abnormal systemic condition may be a factor. This should be done especially in those cases not responding to the usual treatment by local instrumentation. It must be kept in mind that an abnormal systemic condition may be present which be-

cause of its incipency may not be detected, although it is sufficiently harmful to affect the mouth.

Some idea of the area of surface involved may be grasped by noting that if the root or roots of each tooth be infected to a depth of one-quarter of an inch, the total area with thirty-two teeth would be about seven and one-half square inches.

#### VINCENT'S DISEASE OF THE GUMS

A disease of the gums and peridental membranes that may easily be erroneously diagnosed as pyorrhea alveolaris is due to an apparent association of fusiform bacilli and spirochetes. Because it is apparently identical with "trench gum," so frequently reported as affecting the soldiers in France, and because our own soldiers upon their return from duties overseas will most likely present many cases, it is advisable to discuss it. It is our opinion also that more of the civilian population have peridental lesions caused by Vincent's organisms than is generally supposed.

McKinstrey found the gums infected three times more frequently than the tonsils and every case of Vincent's angina gave a history of previous infection of the gums and was accompanied by the gum infection. As the tonsil most likely becomes infected from the gums, it is important to realize this connection. Unless the diseased condition of the gums is cleared up entirely, the tonsils will most likely become reinfected.

General ill health and oral sepsis, cold, dampness, and unsanitary surroundings have been looked upon as factors related to the etiology, though a strikingly large number of cases have been observed where the mouth was well cared for. There is no doubt, however, that lack of oral hygiene plays an important part.

The disease is not widely infective, though it can be conveyed by means of pipes, kissing, cigarette-holders, etc. Because of the number of cases of infection not the result of contagion, McKinstrey thinks that the best explanation of its occurrence is in the frequency with which these organisms lead a saprophytic life in apparently healthy mouths.

The ulceration may be confined to the margins of the gums and may be difficult to detect. When there is no greater involvement, the submaxillary glands are not affected. In other cases the gums and peridental membrane may be affected to the depth of a quarter of an inch or more and then the glands are enlarged and tender. The ulcers are covered with a white friable membrane, which is easily removed, leaving a bleeding surface beneath. There are usually foul breath, pain, bleeding, and bad taste. Unless pyogenic organisms are also present, there is no pus. Ordinarily, there is no rise of temperature nor constitutional disturbance although there may be severe mental depression. The pain is sometimes very severe. The absence of pus (unless there is infection also by pyogenic organisms) and the demonstration of many fusiform bacilli and spirochetes, combined with the clinical findings described above, make the diagnosis certain.

As to treatment, the surfaces of the teeth must be in a smooth, nonirritating condition and the gums free from contact with all irritating foreign bodies.



The toothbrush should be kept in an antiseptic solution when not in use, thus being kept soft and aseptic. Application to the gums of the following:

R Vini ipecacuanhae .....oz. ss  
 Glycerini .....dr. 1  
 Liquoris arsenicalis ad .....oz. 1  
 M. Sig: To be used as mouth wash; do not swallow.  
 Label: "Poison."

or of neosalvarsan once or twice a day is specific and should be continued until smears show no fusiform bacilli or spirochetes. Frequent use of a mouth wash should be urged and the patient required to place ten to fifteen drops of the ipecacarsenic solution on his toothbrush and brush his teeth after meals. If there should now be some inflammation or pus present it will be due to bacteria and these may be destroyed by injecting a 1 per cent solution of iodine in normal saline solution or a 2 per cent solution of the tincture of iodine into the pockets. No case should be discharged as cured until there is complete absence of bleeding points, or there will almost certainly be a relapse. New toothbrushes should now be used.

Besides the tonsils, the mucous membrane of the mouth may be affected, though these conditions are accompanied by diseased gums. The buccal mucous membrane infection is rare, compared with that of the tonsils and the gums. The same treatment as above is indicated.

#### DENTAL EXAMINATION

I wish now to submit to you a plan for a complete oral examination. Nothing short of a thorough examination should be tolerated when a dental or jaw lesion is suspected as being connected with some other pathologic condition. There are altogether too many snap judgments rendered in this class of cases; five minutes or thereabouts is given to the examination when a considerably longer time is by the very nature of things absolutely necessary. A superficial examination is worse than useless, as the patient is falsely assured as to the condition of his mouth. The plan is:

1. Secure a history of the individual teeth, as to past trouble or treatment. This knowledge is often of great value in reaching a decision as to their present condition.

2. Secure roentgenographic plates of the jaws on both sides. A general survey of the field is thus secured and at times valuable information obtained that would be discovered in no other way.

3. Make note of any abnormal condition of the soft tissue of the mouth. (One result would be that many of the mouth cancers would be discovered earlier.)

4. Note missing teeth by number, adopting some systematic method of going over the teeth so that none will be overlooked. Missing teeth may be impacted and be the cause of referred pain.

5. Note all cavities, nearly exposed or exposed pulps, erosion, diseased periodontal membranes, etc.

6. Note all teeth opaque to daylight. Dead teeth are generally opaque.

7. Note all teeth opaque to transillumination by the electric mouth lamp.

8. Note teeth sensitive to percussion.

9. Note teeth failing to respond to stimulation by the faradic current, bearing in mind that large fillings and gold crowns make this test of no value.

10. Note teeth, marked "doubtful" as a result of above examinations, giving abnormal response to stimulation with heat or cold.

11. With intraoral films, secure roentgenograms of all teeth suspicious as a result of above tests.

12. Record findings on a chart suitably drawn up to represent roots and root canals of the teeth.

13. Draw conclusions from the above data. Alone, none of the factors above referred to is conclusive in every case, and for that reason it is urged that use be made of them all in every case. For example, a tooth pulp may



Fig. 6.—Patient troubled with trigeminal neuralgia and arthritis. Plate shows sclerosis of the bone between root apex and inferior dental canal. A similar condition has been known to cause neuralgia because of the pressure on the inferior dental nerve.

be infected and absorption from this source be going on with no lesion that can be demonstrated with the x-ray.

#### ORAL PROPHYLAXIS DURING ILLNESS

The great value of prophylaxis in dentistry can not be disputed and it is unfortunate that greater use is not made of it. It is true, however, that many people do make an earnest attempt to keep their mouths free from diseased teeth. It is of these people I wish to speak. My observations since I started to practice dentistry nine years ago have shown that when these same

people became afflicted with disease, acute or chronic, little or no attention, with few exceptions, has been given by their physicians to the hygiene of their mouths. This is wrong. Patients should be encouraged at all times to look after the welfare of their teeth. Nurses should be so trained that they could clean the teeth of their patients, and until they are the dentist should be called in more frequently. This, of course, applies particularly in chronic cases.

Many people who fully appreciate the value of oral hygiene and who are accustomed to it have septic conditions in their mouths before the end of a long illness. Many physicians realize the possible ill effect of septic foci and some are not slow to condemn dentists for establishing these foci, yet there are very few who will do anything to help prevent these conditions when the



Fig. 7.—Roentgenogram of the left jaw of a girl eighteen and a half years old. For eighteen months previous, she suffered from persistent headache, frontal and occipital; from the latter only occasionally but more intensely. Eyes, ears, nose, and tonsils were normal, according to her physician, who discovered no factor that might be associated with the headaches, other than impacted teeth that he suspected were present. A roentgenogram showed all third molars present, the lower apparently impacted.

The last three or four months previous to removal of lower third molars, she became increasingly neurotic and brooded much over very slight difficulties. She took absolutely no interest in the life that usually appeals to girls of her age.

During the six months since operation there has been much improvement, though complete restoration to normal has not been attained. Patient wishes to return to school, but has been advised not to by her physician. Eats better, sleeps better, and is not so depressed.

This extraoral plate is of value in showing the importance of keeping in mind the probability of "exceptions to the rule." At this age the noneruption of the third molars is not abnormal. Close study of the above cut will show, though, that in this case the uncompleted root is pressing upon the inferior dental canal, and the crown is lodged against the second molar. Bearing in mind that the roentgen rays were directed from behind forward, it will be seen that the impaction may be greater than shown by above illustration. Such proved to be the case at time of operation. A similar, but not so pronounced condition, existed in the other jaw.

patients are under their charge. Healthy teeth should never become septic if properly kept clean, and this is much easier and less expensive for the patient than the filling of cavities or the treatment of diseased gums. The physician whose patient's teeth become badly diseased while he is under treatment is not doing his full duty by that patient.

The above applies in those cases where the patient begins his long illness with his mouth healthy. It is the physician's part to so direct matters that this mouth will stay healthy.

As for those cases where there may be septic foci already established, I will content myself with quoting the following by R. H. Babcock: "As it seems to me, the physician is not doing his full duty in the management of any chronic infections unless he endeavors to search out the possible etiologic factor or factors and, on discovering infected foci, advises their removal." The following is by C. H. Mayo: "With the recognition of the fact that many of the acute and chronic diseases, local and general, arise from a local focus, the most common source being the mouth, the true importance of dentistry is now recognized and a dentist should be associated with every clinic and hospital, or subject to consultation call."

#### SUMMARY

1. It is important that the infant use its sucking muscles vigorously and that the growing individual overcome resistance in masticating food.

2. The treatment of the peridental lesions requires a consideration of a possible predisposing systemic condition and infection with amebæ or fusiform bacilli and spirochetes in addition to the usual local injuries and bacterial infection.

3. Vincent's disease of the gums, because of its highly probable increase upon the return of the soldiers from overseas duties, and because there are more cases of this disease occurring in the civilian population than is generally suspected, should be borne in mind when cases of diseased gums and peridental membranes present themselves for treatment.

4. A complete dental examination should be insisted upon when a dental lesion is suspected as a causative factor in some other pathologic condition. The roentgen ray or any other means of examination is not infallible in every case.

5. The importance of oral hygiene in illness should be kept in mind. Patients suffering from a long disease should not develop septic dental lesions when at the beginning of the illness the teeth are healthy. Patients suffering from chronic systemic disturbances should have any septic dental lesions present eliminated.

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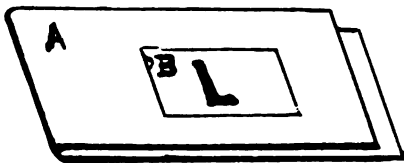
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### A CONVENIENT PLATE MARKER\*

BY E. B. KNERR, M.D., KANSAS CITY, MO.

A VERY convenient plate marker may be made as follows: Bend a strip of sheet aluminum  $3\frac{1}{2}$  by  $\frac{3}{4}$  inches in the middle in the shape of a clip. To this attach by means of adhesive such lead markers as may be desired and slip the clip over the envelope-enclosed plate near a corner or other convenient place, at the time of exposure. Several such clips with "R" on one side as a "right" marker, and "L" on the other side as a "left" marker will serve ready usage. I have made and used these clips now for several years and prefer them to any other device yet suggested.



A = Aluminum Clip.  
 B = Adhesive.  
 "L" = Lead Marker fastened  
 under the adhesive  
 to the clip.

### Announcements.

THE editor has received the following announcements: Dr. Oscar Busby, of Marshall, Texas, has removed his office to 712 Wilson Building, Dallas, Texas, practice limited to orthodontics and to consultation in the correction of dentofacial deformities; Dr. J. Frank Nelson announces the opening of his new offices for the practice of orthodontia in the Marshall Field Annex Building, Chicago, Illinois; and Dr. Carroll C. Johnson announces the opening of his offices, in the Exchange Building at Memphis, Tennessee.

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**DEPARTMENT OF  
ORAL SURGERY AND SURGICAL ORTHODONTIA**

Under Editorial Supervision of

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**REPORT OF A CASE OF PATHOLOGIC FRACTURE OF THE  
MANDIBLE CAUSED BY A MALPOSITION OF A BICUSPID**

By M. N. FEDERSPIEL, D.D.S., M.D., MILWAUKEE, WIS.

**P**ATIENT CHAS. B., age thirty-eight years; occupation, laborer.

*Complaint.*—Fistula below the mandible in the region of the right bicuspid teeth.

*History.*—In April, 1918, patient noticed external swelling in region of



lower right bicuspid; the swelling was about the size of a walnut and hard to touch. A few weeks later it broke and a large quantity of pus was discharged. Patient neglected caring for the wound and soon pain became very severe until September when he was referred here.

*Examination.*—Upon palpation of the jaw a slight grinding sensation was felt. Further examination with the aid of the x-ray revealed a bicuspid tooth lying in the jaw bone upside down causing a fracture in the mandible. There was also a morbid condition involving the root-end of the cuspid on the same side. This, no doubt, was a contributing factor in bringing on the infection. See illustration.

*Treatment.*—Bands with hooks were fitted to the upper and lower incisors and to one upper and lower molar on each side and were then cemented in place. Patient was then referred to Trinity Hospital. Under ether anesthesia an incision one and a half inches long was made beneath the mandible and the soft tissue was retracted. The bone was exposed and the embedded tooth dissected out; the cuspid was extracted and the entire area curetted. The borders of the broken bone were thoroughly freshened and the wound was packed with iodoform gauze to permit drainage. The wound closed and the next day the bone was put at rest by ligating the banded teeth with wire ligature.

After one week the wound showed no further signs of pus. Three weeks later the bands were removed and the patient was discharged.

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## ABSTRACT OF LITERATURE

### **Ununited Fractures of the Mandible. Percival O. Cole. Proceedings of the Royal Society of Medicine, April, 1918.**

Cole says that cure of this condition can be obtained only by direct surgical intervention. Palliation belongs exclusively to the dental surgeon, but cure lies in a realm shared equally by dentist and doctor. The author's estimate of nonunion is based on experiences that in one thousand unselected cases of fracture treated on ideal lines, nonunion will occur in one hundred. In ten of these, operation to determine union will be impracticable. The essence of his method is the control of the edentulous posterior fragment by a padded extension piece which enables him to think of the mandible as though the fragments were once more in continuity, and the use, then, of an anatomic articulator makes the question of correct occlusion no longer guess work. The operation of bone grafting for united fractures of the jaw has passed beyond the experimental stage into the region of assured success.

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## EDITORIALS

### The International Journal of Orthodontia and Oral Surgery

IN January, 1915, the first issue of the International Journal of Orthodontia made its appearance, and since that time a great many things have been added to the world's sciences. For four years we have demonstrated the possibility of publishing a journal devoted to orthodontia as a science and as a specialty; and, while we may have fallen below our ideals in a great many respects, during the four years we have gathered together more orthodontic literature than was ever assembled in any other one journal. Just how much this has contributed to the advancement of orthodontia as a science must be decided by the future; but we believe that any specialty, in order to develop as it should, must have some medium for the publication of the ideas that develop in the minds of those following the profession; and a greater amount of good can be done by having the articles pub-



lished in a journal the editorial policy of which is particularly interested in the specialty.

In our endeavors to conduct a journal for the advancement of orthodontia, we early realized that orthodontia consists of more than mere regulating appliances, and that it would be necessary to broaden our scope in order to get articles bearing on all its phases. One of the closest subjects to the science of orthodontia is radiography; consequently we established a Department of Radiography, believing that it would not only be of interest to orthodontists, but would also act as a stimulus to radiographers, for, so far as we know, at that time there was no journal in the dental profession having a department of radiography. Whether the addition of this department will help radiography as much as it has stimulated the interest in radiography along orthodontic lines is a question which can not now be answered.

Shortly after the establishment of the Department of Radiography we realized that certain phases of orthodontia are also intimately connected with oral surgery, and we established a Department of Oral Surgery and Surgical Orthodontia. Dr. M. N. Federspiel, owing to his knowledge of both subjects, was placed on the editorial staff. Some of our critics have contended that oral surgery was not orthodontia and that there was no relationship between the two subjects. However, looking at it from a scientific standpoint, there probably are no two specialties more closely associated than these, as certain types of malocclusion can only be treated by surgical interference. That a number of prominent men believed in this close relationship was proved by the fact that when the United States entered the war and the dental corps was being organized, the men in charge of the Department of Oral and Plastic Surgery at once recognized that men who had special orthodontic training made much better students in oral surgery courses. If the men in charge of the Department of Oral and Plastic Surgery recognized the importance of orthodontia as related to oral surgery, it is to be expected that a number of the dental profession should also take the same attitude. The Preparedness League also realized the importance of orthodontia, and in recommending the formation of the dental units, suggested that each unit contain an orthodontist and an oral surgeon along with the men trained in other branches of dentistry. In other words, men associated in army work placed orthodontia and oral surgery side by side.

We now believe that oral surgery is becoming more and more an important factor in the life of the dental profession, and that no specialty is so closely associated with it as is orthodontia. As a result of the conditions brought about by the war, oral surgery will play a much more important part in dentistry than it has in times past; therefore those interested in oral surgery should have some medium to which they can contribute their articles and have them receive the proper attention and be sure to come under the observation of the men who are interested in the work. Up to the present time articles on oral surgery have been published in medical and dental journals, but neither has been particularly anxious to have such articles, as they were believed to be of interest to only a limited number of men in these professions. It seems that oral surgery at the present time is very much of an outcast, and, not having a special journal of its

own, is practically suffering the same as orthodontia did before a special publication was provided.

Because we feel that there is a real need for a journal devoted to oral surgery, and that oral surgery and orthodontia are very closely associated, we are adding the words "and Oral Surgery" to the name of the *International Journal of Orthodontia*, which will henceforth be known as the *International Journal of Orthodontia and Oral Surgery*. The science of orthodontia will receive just as much attention as previously, and men who have subscribed for the journal will receive the same amount of orthodontic information, and, in addition, will receive, for the same subscription price, articles on oral surgery, the majority of which will be extremely interesting to men who confine their practice to orthodontia. Men interested in oral surgery will have a means of contributing their original thoughts, and those interested from the standpoint of the student, will have access to a journal that will contain articles of vital interest to all.

It is our intention to publish in the Department of Oral Surgery as many original articles as can be given to the profession in each issue. In addition to this, we have secured a man whose duty it will be to abstract the literature on oral surgery including that appearing in foreign journals. A large number of articles have already appeared in foreign journals, the majority of which have passed the English reader unnoticed.

With the formation of the International Journal of Orthodontia and Oral Surgery, we will devote no less space and attention to orthodontia, but will simply give our subscribers the additional advantage of an oral surgery department.

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### Malocclusion and Pyorrhea Alveolaris

**D**URING the past year several articles have appeared dealing with the relation which exists between malocclusion of the teeth and inflammation of the gingival tissues. However, there is still much that can be said on the importance of these two subjects, and the correlation which exists between them. Almost every paper written by men interested in the treatment of pathologic conditions around the necks of the teeth calls attention to the fact that malocclusion is an important etiologic factor, and many men also claim that the treatment of malocclusion with improperly fitted appliances produces inflammation of the gingival tissues. We are forced to admit both views are more or less correct.

Our attention was recently called to the relation of pyorrhea alveolaris and malocclusion by an article written by Dr. Thompson, published in the *Journal Allied Dental Societies*. Quoting the article, we find: "Pyorrhea alveolaris, that term which covers a multitude of sins, finds its incipient cause in malocclusion, want of occlusion, bands irritating the pericementum, poorly filled roots, etc." Out of four causes given for the production of pyorrhea, three of them are intimately concerned with orthodontia; namely, malocclusion, want of occlusion, bands irritating the pericementum.

It seems to be a very well-established fact that the teeth which occupy malpositions can not be kept clean, and consequently lend themselves as etiologic

factors in the production of gingival irritations. It is also known that bands irritating the peridental membrane are a predisposing, or an important, factor in the production of diseased gingival tissues; but, of course, every man claims that it is the other's bands which produce that harm. Therefore, while orthodontia is a strong factor in the prevention of gingival irritations, by the correction of malocclusion, it also in some instances becomes a prominent cause in the production of gingival irritations by the use of improperly constructed appliances, the principal one of which is improperly made bands.

A few years ago it was a common plan to use bands which were produced by manufacturers, and the band was sold with the understanding that it must be placed upon the tooth in the same form as it was made by the manufacturer. As a result of this, bands which were entirely too wide were used, and produced a great amount of harm owing to the fact that they were improperly fitted and improperly contoured. Certain bands were placed on the market which were made universally, and some were contoured to fit an upper right or a lower left molar. Manufacturers who possessed no knowledge of the anatomy of the teeth and who were able to get dentists to use such bands, necessarily unknowingly became factors in producing gingival irritations, because no clamp band is made that will fit an upper molar that can be used on a lower molar unless it is entirely recontoured and reshaped.

We also find men who advocate the making of bands very wide, thereby avoiding any possibility of their coming off the tooth during orthodontic treatment. There is no other factor that is producing so much gingival irritation as the wide bands made with the sole purpose of being cemented so that they will never become loosened. We believe that it would be more hygienic and much less harmful to use a band which is narrow, even though it would become loosened occasionally by the stress of mastication, than to use a wide band jammed down upon the gingival tissues to such an extent as to produce strangulation necrosis, along with the resulting irritation and infection which follows. Therefore, realizing the fact that orthodontia in correcting malocclusion, is a large factor in preventing gingival irritations, we must also look at the other side of the question and realize that the improperly constructed appliance will produce just as much harm as teeth which occupy malposition. However, with the properly constructed regulating appliance made with the knowledge of the shape of the tooth and the physiology of the soft tissue, orthodontia becomes one of the greatest hygienic measures in preventing the inflammation of the gingival tissue that we have.

## ST. LOUIS—THE CONVENTION CITY FOR 1919

**E**VERY orthodontist—in fact, every dental practitioner in the United States and Canada—should arrange now to attend the Nineteenth Annual meeting of the American Society of Orthodontists to be held in the famous Planters Hotel in St. Louis on March 10, 11, and 12, 1919. Just preceding this convention on March 6, 7, and 8, the Alumni Society of the Dewey School of Orthodontia, will hold its next annual meeting at the Statler Hotel. The programs for both meetings are of exceptional merit and should appeal to all who are interested in the science of orthodontia and allied subjects.

During the last few years while the world-war was in progress many in the profession of dentistry have been denied the privilege of taking a vacation. The strain of constant service in the army dental corps, in private practice due to the



The retail district of St. Louis is a revelation to visitors. This photograph shows Olive Street looking east towards the Mississippi River, known throughout the country as "The Olive Street Canyon."



St. Louis is a city of wonderful "skyscrapers." This shows the Railway Exchange Building, the largest office building in the world. It occupies a full city block, has 30 acres of floor space, and is 21 stories high.

lack of practitioners, and the great amount of time devoted to patriotic activities, all have conspired to keep the dentist very busy. This is an opportunity to combine business with pleasure.

You will like St. Louis and the friendly spirit and cordial neighborliness of St. Louis people. The culture of the East, the energy of the North, the hospitality of the South, the vision of the West—these are all embodied and blended in this cosmopolitan metropolis of the Mississippi Valley. You will find St. Louis a happy place for the convention visitor and the tourist—where convenience and comfort abound—where attractiveness and hospitality mingle in a conspiracy to make you want to come back and dwell—a great deal to see and enjoy—a city that has done and is doing things in a big way.

St. Louis is a city modern in office buildings, hotels, parks, cafes, and theatres, but at the same time older than the United States and rich in romantic traditions. Here is a city in the heart of hill and valley scenery that equals the Berkshires and the Palisades, but at the same time accessible by twenty-six railroads, midway between the country's geographical and population centers and within a night's ride of thirty million people. Day by day, and season for season, St. Louis will give you weather as good as any other American city, and better than most of them.

The story of a century of a remarkable city building unfolds itself to a



The Municipal Courts Building and City Hall. Showing a few of the municipal buildings centered in the heart of St. Louis.

visitor who sees St. Louis. It is a story graphically illustrated with a striking panorama of splendid commercial structures, great industrial plants, networks of railroad terminals comprehensively designed and operated, sweeping acres of beautiful parks, avenue upon avenue of beautiful homes, imposing public buildings, and mile after mile of improved thoroughfares. It is the story that shows what has risen from one of the early inland fur trading posts—the great metrop-

olis of the Mississippi Valley—a city spread along 19 miles of the historic Mississippi River.

St. Louis offers a variety of attractions and entertainments. Besides the downtown theaters and others located in some of the outlying sections of the city, there are, as attractions, the public parks which abound in natural beauty, the Art Museum, the Public Library, the Jefferson Memorial, the great zoo, etc. Forest Park, one of the largest public parks in the country, has an acreage of almost 1,400. All of the principal parks of St. Louis are spread across the city



The famous Planters Hotel, where the meeting of the American Society of Orthodontists will be held. Here will gather on March 10, 11, and 12, the leading orthodontists of America.



The New Statler.



American Annex.



Maryland Hotel.



American Hotel.



Warwick Hotel.



Marquette Hotel.



Jefferson Hotel.

#### A FEW OF THE GREAT HOTELS OF ST. LOUIS.

in the form of a beautiful park belt, connected with one another by the Kingshighway Boulevard system.

St. Louis has a large number of well-conducted hotels which rank with any in the United States. Whatever his tastes or the time of his arrival, the visitor will find the sort of entertainment he likes at prices he approves. The shops—from biggest department store to tiniest specialty shop—are a revelation to the visitor. Among the unique and most beautiful features of the city are the residential sections, which are practically enclosed private streets called "places." Here in the quiet surroundings of parks and lawns are the homes of the wealthy,

and it can be very truthfully said that no city equals St. Louis in the number of its splendid residences and beautiful terraced private gardens.

St. Louis is nationally known for its public school system and great universities. St. Louis University, founded in 1818, is the oldest University west of the Mississippi, and has a great reputation for its medical and dental departments. Washington University shows the model of a modern University plant. Its red granite buildings stand on an eminence just west of Forest Park. The new Barnes Hospital and Washington University Medical and Dental Schools give St. Louis one of the most modern and best appointed medical and dental centers thus far realized, either in this country or abroad.



"Art Hill" in Forest Park, showing the St. Louis Municipal Art Museum, which stands on an eminence overlooking the western section of the city.

Arrange now to come to St. Louis. You can generally improve a journey north, south, east, or west by using the St. Louis gateway, with stop-over privileges. Arrange to stay as long as you can but be

assured of enjoyment though you may stay only a few hours. You will not regret coming to St. Louis to attend the meeting of the American Society of Orthodontists—you will meet and mingle with the leading orthodontists of North America, you will get new inspiration to take back home with you, and above all, you will enjoy your trip to the great metropolis of the Mississippi Valley.



Entrance to Kingsbury Place, one of the numerous private residence "Places" for which St. Louis is well known throughout the world.

## The Angle Alumni Meeting Twelve Years Ago In St. Louis

IN CONNECTION with the announcement that the Nineteenth Annual Meeting of the American Society of Orthodontists will be held in St. Louis, March 10, 11, and 12, of this year, it is interesting to note that twelve years ago in December, the Second Annual Meeting of the Alumni Society of the Angle School of Orthodontia was held in this city. Hidden away, unmolested for twelve years, we have just discovered in our old files, the beautifully printed and arranged menu of the Second Annual Banquet given at the Hotel Jefferson, Friday, December 13th, 1907. Many of our readers will no doubt be interested in the "toasts" which are reprinted from this menu, below:

### AFTERTHOUGHTS

*Dr. G. F. Bowman, Toastmaster*

"Orthodontia" *Dr. Rolof B. Stanley  
Dr. F. B. Noyes*

We first learn to play with it academically, as the magnet was once a toy, then we see in the heyday of youth and poetry that it may be true, that it is true, in gleams and fragments. Then its countenance waxes stern and grand, and we see that it must be true. It now shows itself ethical and practical.  
—Emerson.

"The Old" *Dr. Richard Summa*

While words of learned length and thundering sound,  
Amazed the gazing rustics ranged around,  
And still they gazed, and still the wonder grew,  
That one small head could carry all they knew.  
—Goldsmith.

"The New" *Dr. Martin Dewey*

For still the new transcends the old  
In signs and tokens manifold.  
—Whittier.

"The Journal" *Dr. A. H. Ketcham  
Dr. Martin Dewey*

There is a proper dignity and proportion to be observed in the performance of every act of life.—Marcus Aurelius.

"The Ladies" *Dr. J. D. McCoy  
Miss G. Mendal*

To gild refined gold, to paint the lily  
To throw a perfume on the violet,  
To smooth the ice, or add another hue  
Unto the rainbow, or with taper-light  
To seek the beauteous eye of heaven  
to garnish,  
Is wasteful and ridiculous excess.  
—Shakespeare.

"Dr. Angle" *Dr. Henry C. Ferris  
Dr. Jas. Hoggan  
Dr. Angle*

Beware when the great God lets loose  
a thinker on this planet.—Emerson.

"The School" *Dr. Wellslake Morse  
Miss Anna Hopkins*

Our hearts, our hopes, are all with thee—  
Our hearts, our hopes, our prayers, our tears;  
Our faith triumphant o'er our fears  
Are all with thee,—are all with thee.  
—Longfellow.

"Dr. Dewey" *Dr. Frank E. Shelden  
Dr. Martin Dewey*

He makes no noise over a good deed,  
but passes on to another as a vine to  
bear grapes again in season.  
—Marcus Aurelius.

"The Class" *Dr. F. B. Noyes  
Dr. William C. Smith*

Unblemished let me live, or die unknown;  
O grant an honest fame, or grant me none.  
—Pope.



### **The Mammalian Dentition\***

**A** MOST complete and satisfactory study of the mammalian dentition is presented in Dr. Todd's new book. More than 100 pages are devoted to a consideration of the environment, evolution, and dentition of the lower vertebrates; the ancestry of the mammalia; the relation between life habits and dentition; and a chapter each on the insectivora and the primates. There are also several chapters given to the study in evolution of herbivorous types, one devoted to the edentata showing retrogression in evolution, and one chapter on the carnivora, illustrating evolutionary divergence. The chapters dealing with human dentition including the deciduous, with their anomalies, are of great interest, dealing with the subject from a paleontological viewpoint. In studying other families of the primates, the author traces the line of evolution progressively from some early or primitive form. In the case of man this has been found to be impossible since no human or prehuman type has been discovered which can, with certainty, be assigned to a period more remote than the early glacial epoch. The earliest authentic example of the human race, known as the Heidelberg man, is known only from the mandible. A detailed description is given of this and other early examples of dentition. In the chapter on anomalies of human dentition the author deprecates the fact that dentists have not made a more careful investigation into the causes of variations in number, position, and form of the human teeth, as too often the valuable data to be obtained only by him are lost or destroyed in consequence of the tendency to consider these anomalies merely as freaks.

The statement is made that variations in position of normal teeth are always of pathological origin, which, if true, is of great practical significance and especially so to the orthodontist. Chapter XX is devoted to a study of the roots of teeth, which are said to be less subject to environmental changes than are the crowns, though even here changes are noted, the bicuspid in the anthropoid having three roots, instead of one, as in man. The relative shortness of the roots in human teeth is also the exact opposite of that found in the orang-outang. The volume closes with an interesting chapter on the evolution of types, in which the author concludes that modifications in dentition are in part the expression of hereditary constitutional factors, concerning which nothing is at present known.

The volume contains 100 illustrations and a complete and very satisfactory index. For the student of mammalian dentition the book can be highly recommended.

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### **Alumni Society of the Dewey School of Orthodontia**

The Alumni Society of the Dewey School of Orthodontia will hold their next annual meeting in St. Louis, March 6, 7, and 8. The usual high standard of the meetings of this society will be maintained. All interested in Orthodontia are welcome. Address communications to Dr. George F. Burke, 731-43 David Whitney Building, Detroit, Mich.

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\**An Introduction to the Mammalian Dentition.* By T. Wingate Todd, M.B., Ch.B., Manc.; F.R.C.S., Eng.; Captain, Canadian Army Medical Corps; Henry Willson Payne Professor of Anatomy in the Western Reserve University, Cleveland, Ohio; Formerly Lecturer in Anatomy Victoria University of Manchester, England. C. V. Mosby Company, Publishers, St. Louis, 1918. 280 pages, 100 illustrations. Price, \$3.00.

# The International Journal of Orthodontia and Oral Surgery

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VOL. V

ST. LOUIS, MARCH, 1919

No. 3

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## ORIGINAL ARTICLES

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### ORTHODONTOGRAPHIC SURVEYING AND THE PREDETERMINATION OF THE DENTAL ARCH\*

BY WILLIAM H. GILPATRIC, D.M.D., BOSTON, MASS.

*Clinician at the Post Graduate School of Orthodontia at the Forsyth Dental  
Infirmary, Boston, Mass.*

MR. PRESIDENT and Members of the Harvard Odontological Society: It gives me pleasure to present before this society my work on the orthodontographic normal arch and its use in the correction of malformed arches. I am constrained to say that the conservativeness of the dentist is of such a nature that he will much more quickly accept the novelty presented by an able vendor of a new appliance, and cure-all medicines, than investigate and form an opinion and decide for himself.

Many nostrums appear promiscuously in the market, powerful advertising campaigns give them strength, the dentist is impressed with their many qualifications, and sees in them the solutions of his problems. He soon applies them, temporarily damages the patient's teeth and arch, and his own reputation more or less permanently.

What guides the orthodontist or the general practitioner in his diagnosis? Usually his supposedly trained eye. He sees a rotated cuspid, a mesial central, or a distal lateral, and quickly concludes that by applying an expansion arch and ligating these teeth to the arch in one manner or another he will, with the aid of nature, restore normal occlusion. He has not reasoned that an arch has the limitations of the principles forming it, and the results of orthodontic treatment are in direct ratio to this diagnosis. He, therefore, has no

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\*Read before the Harvard Odontological Society, Boston, Mass., November 21, 1918.

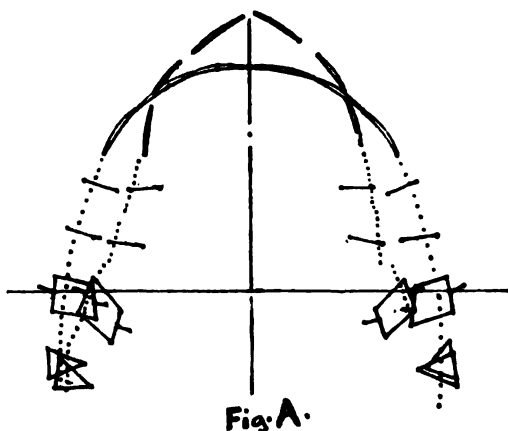
foundation to guide him as to how much he should do or to what extent he should go. He does it empirically.

Tonight I shall endeavor to prove that the mapping of the malformed arches, the measurements of tooth substance, and the use of the orthodontographic arches are a simple and scientific method of obtaining the normal occlusion. The orthodontographic survey is based on the principle that the sum total of the substance of the teeth of a given dental arch can only occupy a certain arch in the mouth. Therefore, charts designating the place of these teeth are accordingly made, locating the position of every tooth in the arch at the time, plus the average tooth substance for the unerupted teeth as given by Black.

The direction of thought of every profession has concentrated towards its pursuit, omitting almost to exclusion, allied subjects. This has narrowed the views of the investigator, and in many cases the concentration upon one particular point has obstructed his view, depriving him of seeing the many phases offered by the subject.

In orthodontia, the practitioner has seen in all his patients only malforma-

**UPPER 87.5M.M.**



**Fig. A.**

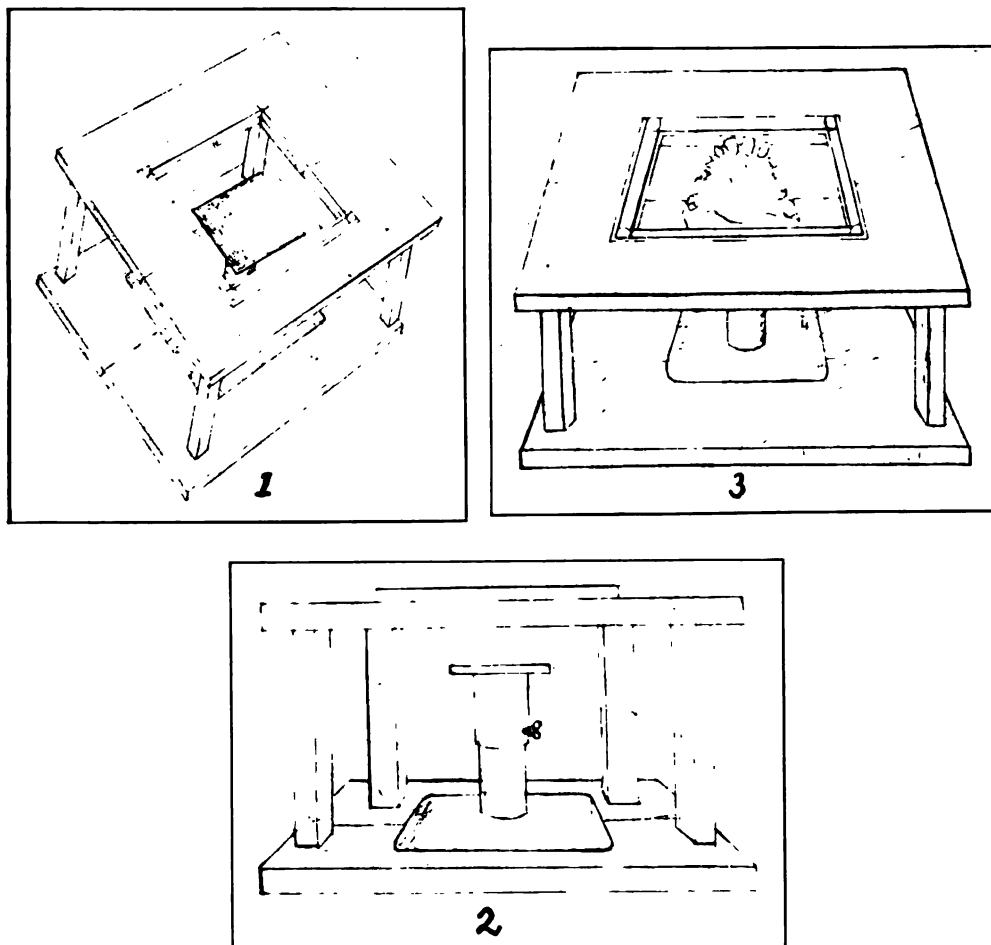
tions, just as the criminologist sees only criminals, disputing the normal cases by considering them as relatives. We propose to establish normality, a standard normal arch, based on the sum total of tooth substance, and from this standard we can compare and establish the abnormal. It is evident that a number of teeth of a given arch, aligned from contact point to contact point can not vary in formation on the arch, buccally or lingually, and be normal. It is an error to consider that the differences of average between the sum total of tooth substance of the upper and lower teeth shows abnormality; on the contrary, the proportion, as a rule, is from 8 to 12 mm. less on the lower than on the upper, which is normal. The range of tooth substance of the upper arch from the buccal groove of the first molar to its opposite mesiodistal diameters, on 400 cases has been from 78 to 101 mm. of tooth substance; 90 per cent between 82 and 89 mm.

A case in which the lower is larger than the upper is very rare—1 to

400, regarding overbites. The latitude of variations of the overbite allows us to get normal occlusion for the case in hand.

We find the cuspid to be in as many as 90 per cent of cases in proper position or nearly so, buccally or labially although the rest of the teeth may be abnormally located.

We find second molars most constantly in their normal position buccally regardless of the other complications anterior to them (see Fig. A). While each arch has its individuality shown in the cusps relation, which may vary



slightly from the normal, it could not be constructed as abnormal, inasmuch as perfect occlusion exists.

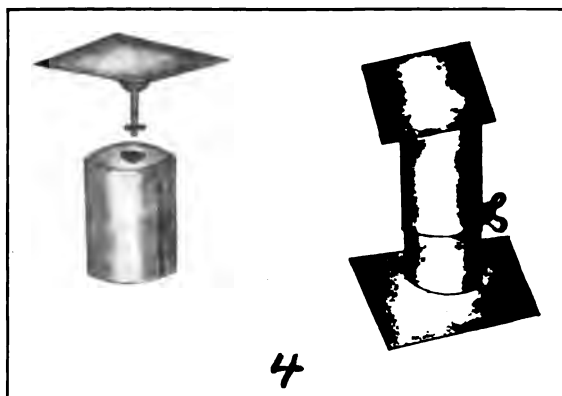
In respect to the theory of inheritance regarding the small jaw and the large teeth in the same individual, it is true only so far as nature has not developed the jaws sufficiently to accommodate the dental units. Relating to the theory of prognathism of upper and lower jaws as being normal to a particular type or individual, this also is false, as pertaining to the white race. When these deviations are pronounced, abnormality is produced, either by having a wide or narrow expanse on the molar region, in both of which cases

an abnormal expression results. Therefore, I contend, that an average normal arch based on the total sum of tooth substance, is, for the present at least, ideal for the restoration of normal arches. This is the result of necessity, inasmuch as in the past the diagnosis and the outline of procedure has been entirely a matter of personal equation.

The present survey has had its incipency in sets of Trubyte teeth placed on arches (anatomically) corresponding to averages obtained from arches able to contain and support the definite number of teeth of a definite tooth substance. These facts being established, means to obtain surveys of those arches were devised, resulting in an odontographic surveying machine, an instrument with which the position of teeth in an arch may be definitely drawn.

#### DESCRIPTION OF APPARATUS

The apparatus consists of a mahogany table on which is mounted an adjusting leveling table so as to bring the model up to a square glass  $4\frac{1}{4}$  by  $4\frac{1}{4}$  inches and 1 mm. thick, one side has a fine silk finish, which takes the registra-



tion points of a pencil, this glass is attached to the upper table. (Mineral oil is used on the glass to make it transparent.) (Figs. 1, 2, 3, and 4.)

Having the machine at command, the next steps in making the odontographic survey are as follows:

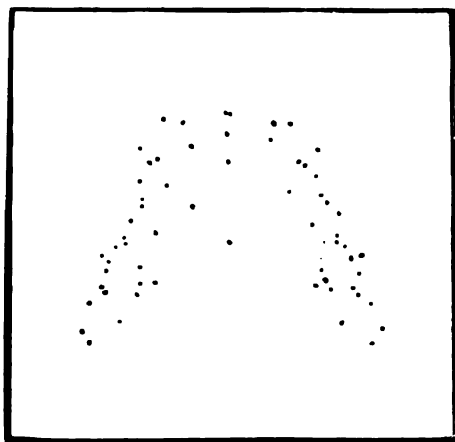
1. Get a good model—plaster impression preferred.

2. Register the cusps of molars and bicuspids—contact points of the molars, bicusps, and the six anterior teeth—get median line from mouth and register on model. After this is carefully done, place model in apparatus, and standing directly over it, register these points on the glass slide. (In registering the cusps and contact points, use one eye the same as when using the microscope.)

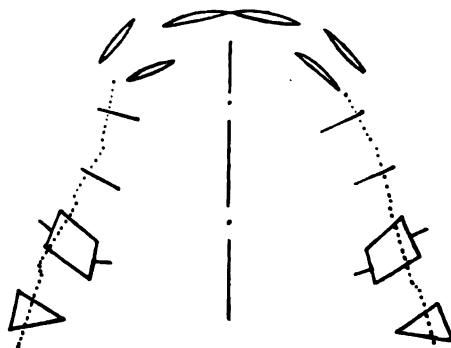
Remove glass, place it upon tracing board, use a very thin transparent tracing cloth held firmly over the glass, register the points on cloth, and you will have the result as shown in Fig. 5.

Fig. 6 shows teeth (anterior) drawn in, contact points of molars and bicusps and cusp points of molars and bicusps.

Fig. 7 shows contact points and cusp points dotted.



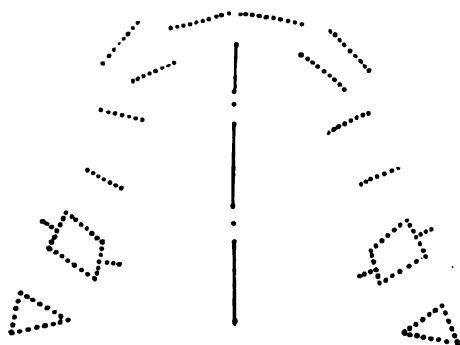
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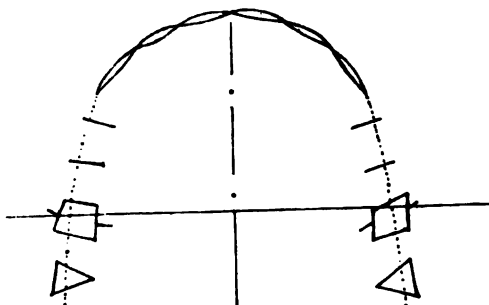
6

Tooth substance 80 m.m.

Arch width 52 m.m.

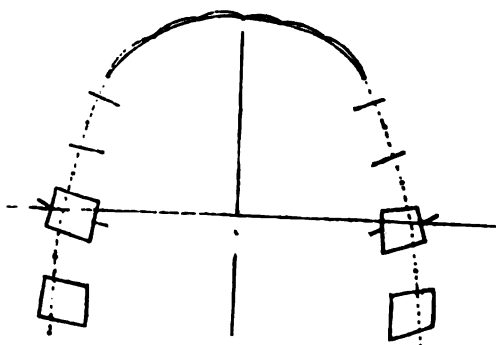


7



8

TOOTH SUBSTANCE 72 m.m.



9

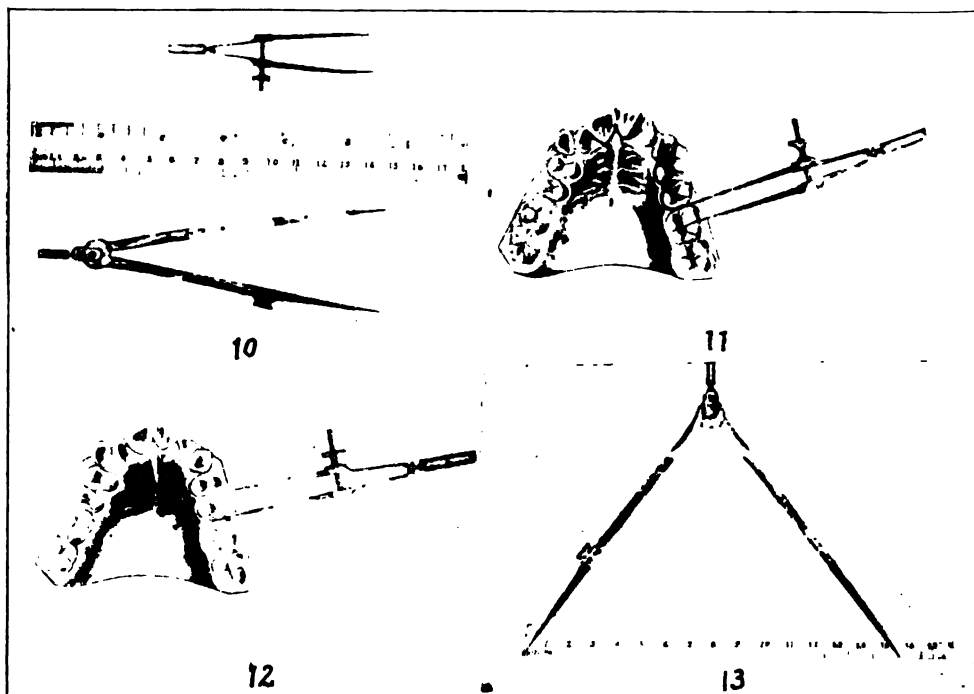
Fig. 8 shows a normal orthodontographic arch having a total tooth substance of 80 mm. and an arch width of 52 mm. in molar buccal groove.

Fig. 9 shows the normal (lower) arch of same case.

#### DESCRIPTION OF INSTRUMENTS

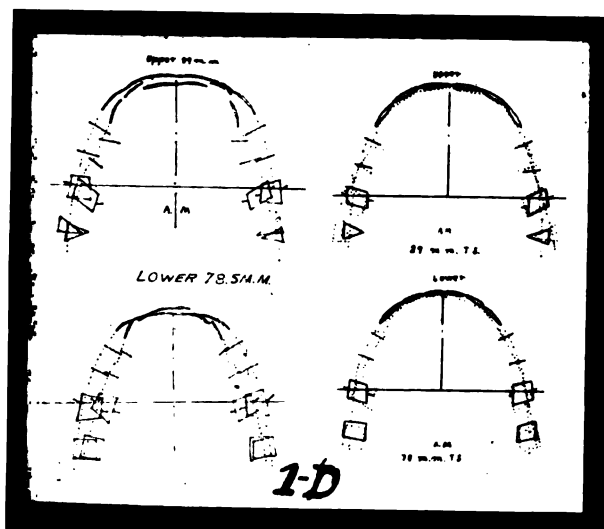
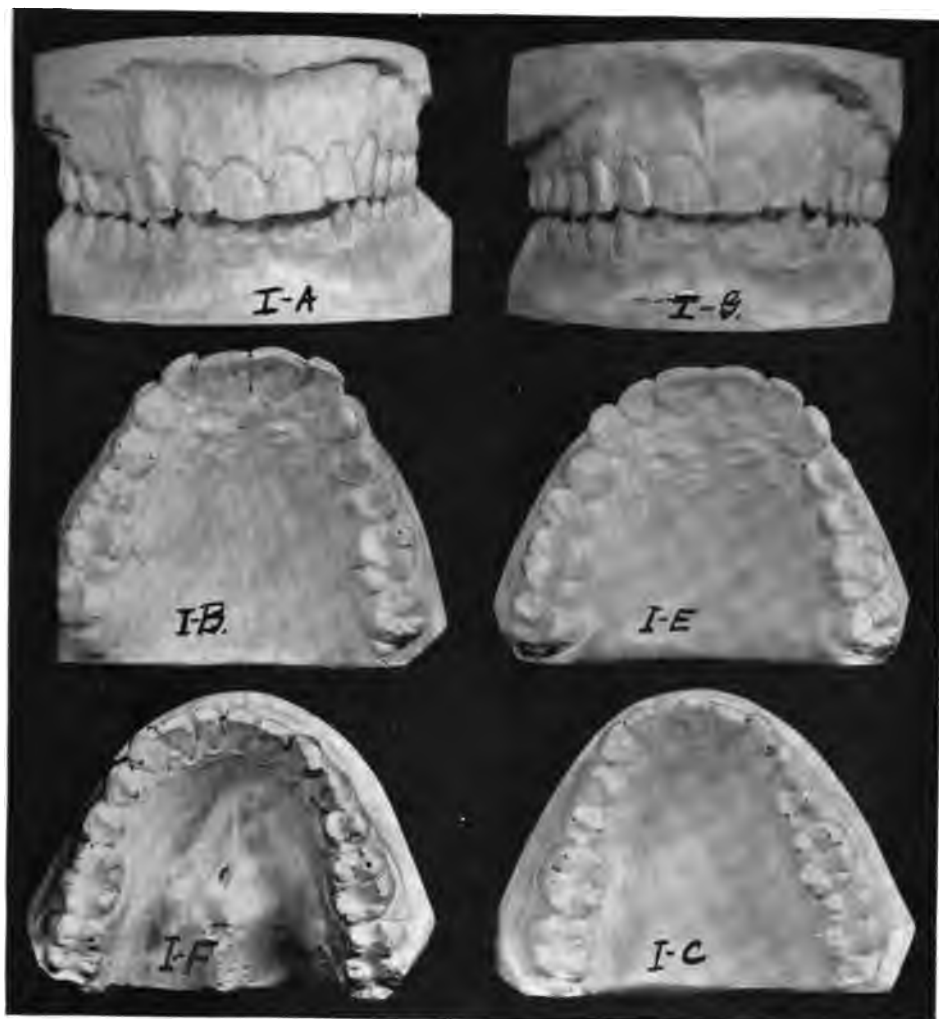
Fig. 10 represents all the instruments necessary to perform the work. They are a pair of big dividers, a pair of small dividers, a millimeter steel rule, and Faber's stenographic pencil 596. Excelsior tracing cloth is used for the tracings.

With small dividers (Fig. 11) measure the distance from occlusal side of buccal groove of first molar to contact point with the second bicuspid (as



shown in Fig. 11). Transfer this measurement by pressing the points of divider into heavy white paper. Next measure the second bicuspid from contact point to contact point as illustrated in Fig. 12. Transfer the measurement to paper, continuing from the points obtained from the molar. Fig. 11 also shows registration marks on cusps and contact points. Now follow the procedure for the rest of the teeth, that is, measure from contact point to contact point and transfer to paper, having one foot of the divider in a previous made mark and the other foot making the new mark, obtaining in this manner one continuous measurement. The opposite first molar is measured in the same manner as the previous molar. This concludes the measurements of individual teeth.

Fig. 13 shows the big dividers transferring the total measurement previously obtained to the steel rule, which gives as in Fig. 8, 80 mm. of tooth substance. In mixed dentures measure all permanent teeth present; and to their total, add the





total given by the missing teeth, taking the average measurement as given by Black.

#### DESCRIPTION OF CASES

Fig. 1*A* shows models of Class I cases (or normal molar relations). This case shows excessive overbite due to malformation of both upper and lower arches.

Fig. 1*B* shows palatal view of same case.

Fig. 1*C* shows lower arch of same case.

This case was surveyed (Fig. 1*D*). The upper arch contained 89 mm. tooth substance from the buccal groove of first molar to its opposite. The upper left-hand figure shows survey of upper malformed arch, superimposed upon the normal orthodontographic arch, containing 89 mm. to show necessary movement. The lower left-hand figure shows lower arch of same case, which contains 78½ mm. tooth substance. This shows that the molars and bicuspsids require tipping instead of bodily movement. The upper right-hand figure shows the progress to date of treatment of upper arch. The lower right shows the progress survey of the lower arch to date.

Fig. 1*E* shows the palatal view of upper arch to date.

Fig. 1*F* shows the palatal view of lower arch to date.

Fig. 1*G* shows the occlusion. Note the change in overbite due to the correcting of the arch line. This case has a perfect anatomic balance.

Fig. 2*A* shows a Class I case (normal molar relations).

Fig. 2*B* shows same case, showing excessive overbite due to the elevation of the anterior maxillary division, carrying the centrals and laterals.

Fig. 2*C* shows lower arch of same case with temporary teeth.

Fig. 2*D* shows surveys of the case, before treating, and the progress to date. The upper right shows survey of upper arch, superimposed upon the normal arch of the same tooth substance. The cuspids had not erupted and the laterals had drifted towards the bicuspsids. Black's average measurements were taken for the cuspids, tooth substance 83½ mm. The lower right-hand figure shows survey of lower arch superimposed upon the normal arch for this case. The lower left temporary cuspid had been extracted, and the lateral had drifted distally almost in contact with the first temporary molar. The teeth which had erupted were measured, and Black's average measurements for the permanent cuspid, first and second bicuspsids on both sides, were added, giving a tooth substance of 74½ mm. The upper left-hand survey shows the progress to date of the upper arch. The lower left-hand shows the progress to date of the lower arch.

Fig. 2*E* shows the palatal view of the case to date.

Fig. 2*F* shows the occlusion to date. Note the change in overbite; this case also has anatomic balance.

Fig. 3*A*, Class I, (normal molar relations) shows outstanding cuspids and instanding laterals.

Fig. 3*B* is the same case, showing front view.

Fig. 3*C* is the palatal view of the upper arch.

Fig. 3*D* shows the survey of the original models and progress to date.

The upper left shows the survey of original model, which contains 84 mm. tooth substance, superimposed upon the normal arch. This survey shows that the movement required is nearly all in the molar and bicuspid region. The upper right cuspid is tipping out slightly. The left cuspid is in the right buccal position, but requires distal movement. The left lateral is in its position, the left central requires slight rotation. The right central is in the correct position, the right lateral requires slight mesial movement. The left lower

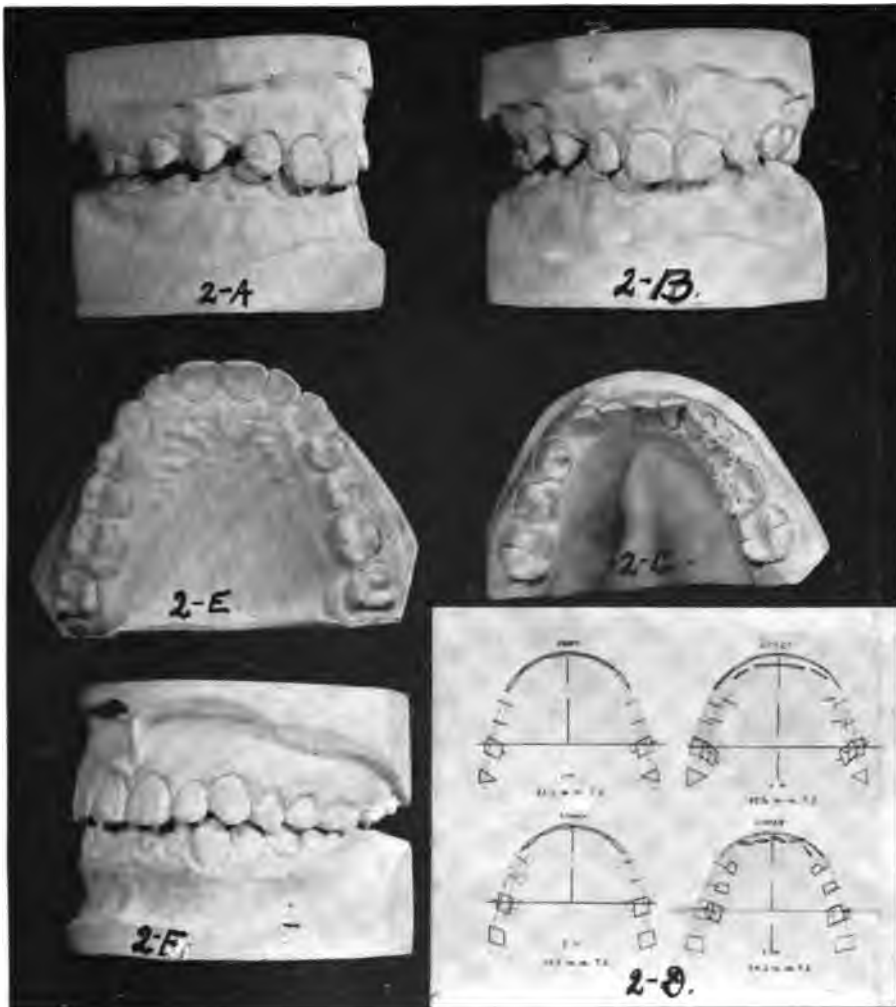
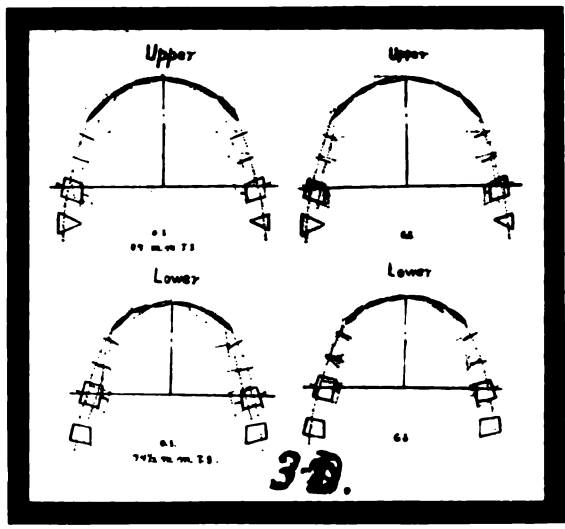
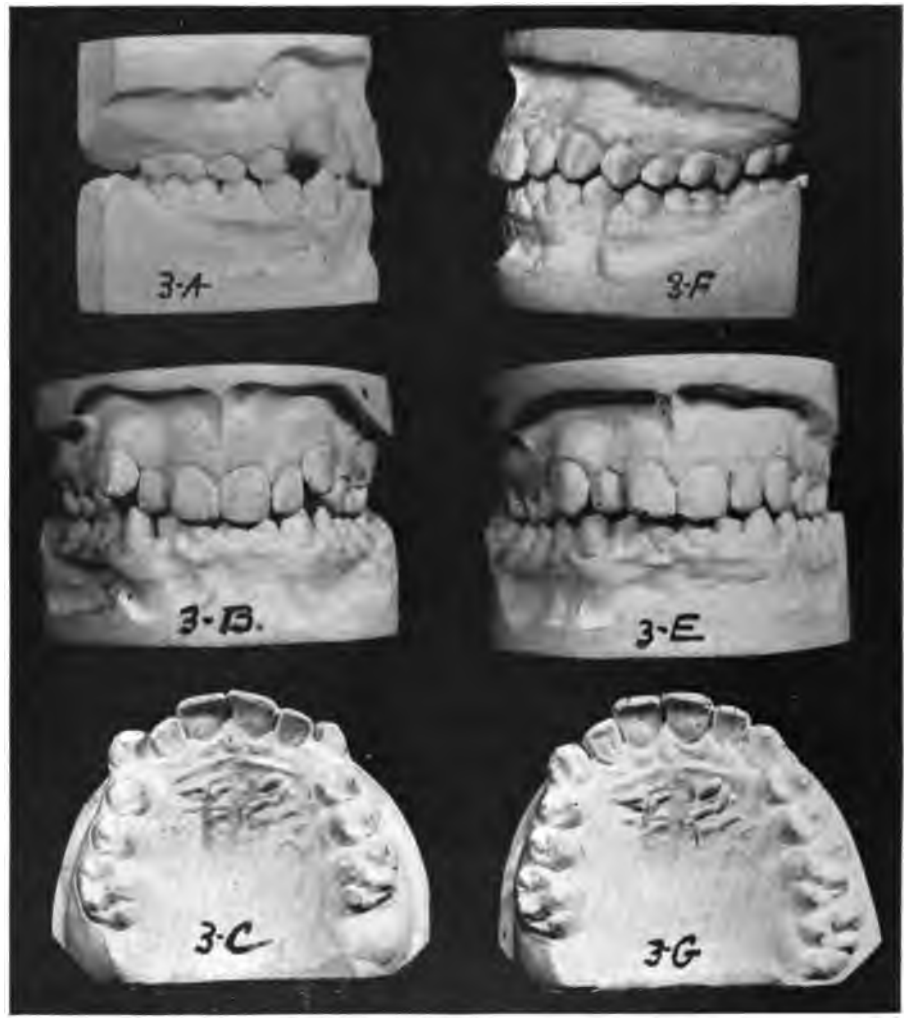


figure is the survey of the original malformed arch, superimposed upon the normal arch. The treatment indicated is molar and bicuspid expansion, also cuspid expansion, and mesial movement of right and left laterals. The right upper figure shows the progress to date of the upper arch. The right lower figure shows the progress to date of the lower arch.

Fig. 3E shows the front view of progress models.

Fig. 3F shows the side view of progress models.

Fig. 3G is the palatal view of the upper arch, which requires slight rota-



tion of the right cuspid, right central, and slight mesial movement of the right lateral.

Fig. 4A shows a Class II case (distal relations of the molars). Note the excessive overbite.

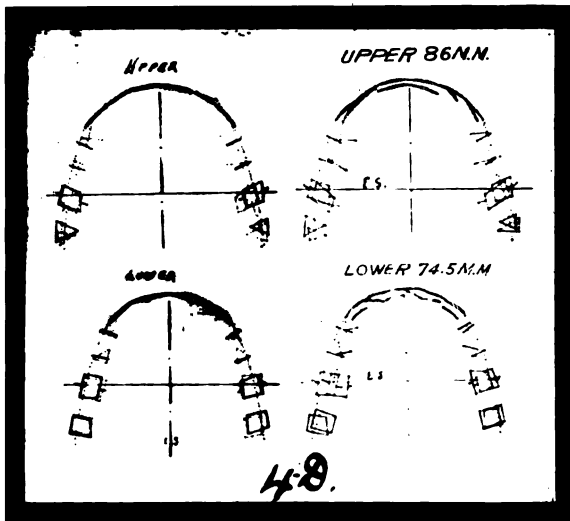
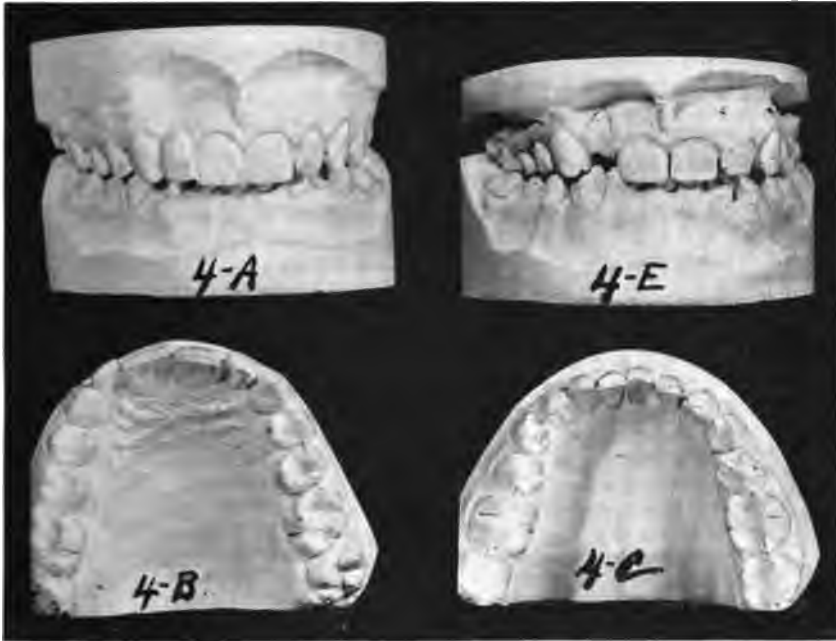
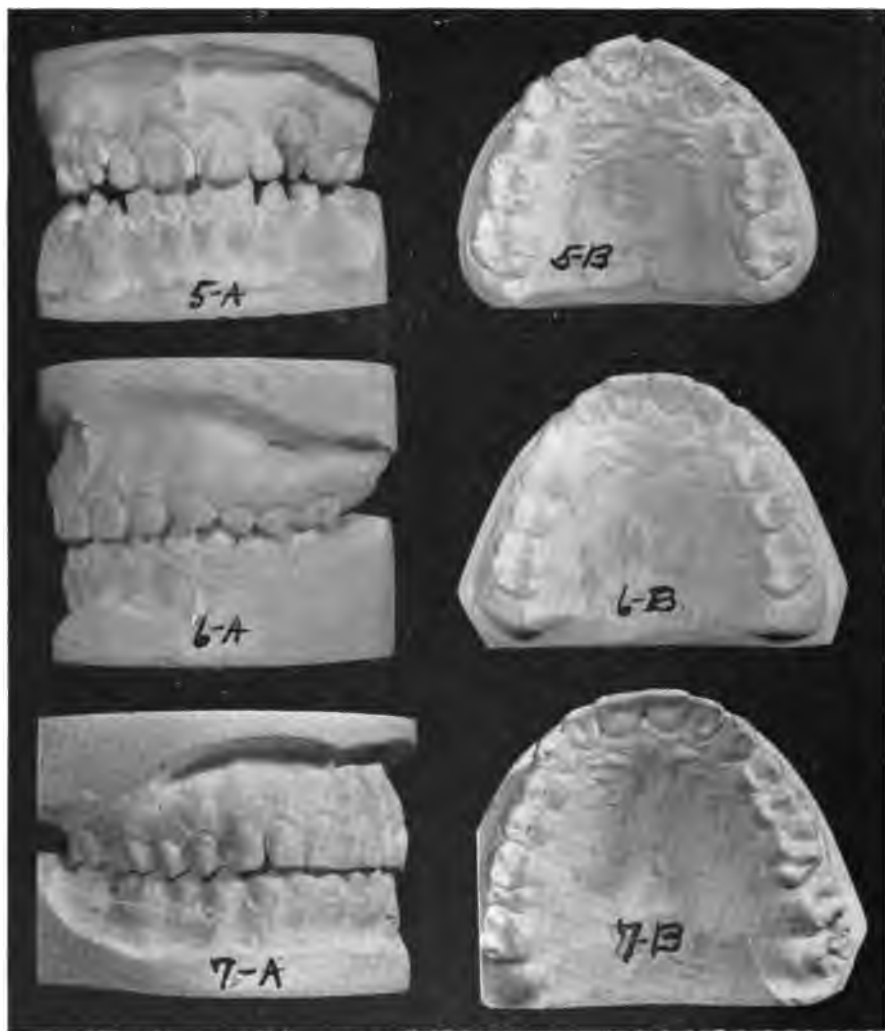


Fig. 4B shows the palatal view of the same case. This was complicated by congenital absence of the right lateral.

Fig. 4C shows the lower arch of the same case, and excessive tipping of bicuspids and molars.

Fig. 4D shows the surveys of the original models and progress to date. The upper right shows the original survey of the malformed arch, superimposed upon the normal arch, 86 mm. tooth substance. Note the slight movement required by the cuspids and laterals, and the greater amount of movement required by the centrals. The left molar and bicuspid require less movement than those on the right. The lower right figure is the survey of the original malformed arch, superimposed upon the normal arch, 74½ mm. tooth



substance. This survey shows that the first molars and bicuspid should be tipped, not moved bodily, the cuspids expanded, mesial movement to take place, and rotation of the four incisors. The upper left shows progress survey to date of the upper arch. The lower left shows the lower arch progress survey to date.

Fig. 4E shows progress models to date (these are compound study models). Note the change in overbite. The upper left lateral has a collar

with spur running over cuspid to prevent rotation. By placing the teeth in their correct arch form or as nearly correct as possible to date, the lower jaw has assumed its normal mesiodistal position, therefore, I contend that in all Class II cases it is only necessary to place the teeth in the correct arch line, and intermaxillary rubbers are not required.

Fig. 5A shows a case with left upper cuspid apparently in a buccal position with instanding lateral.

Fig. 5B shows palatal view of same case. Note second temporary molars still in position.

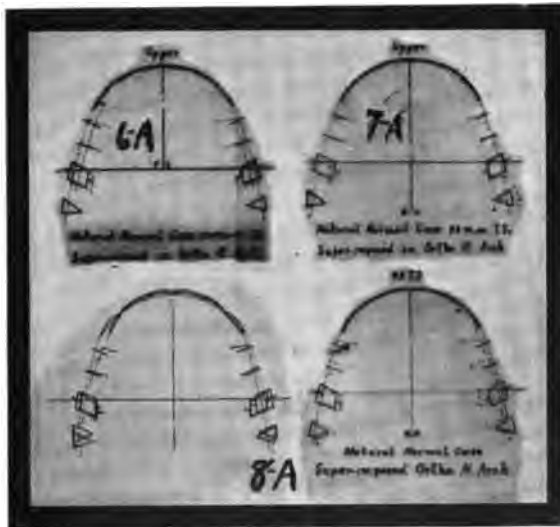
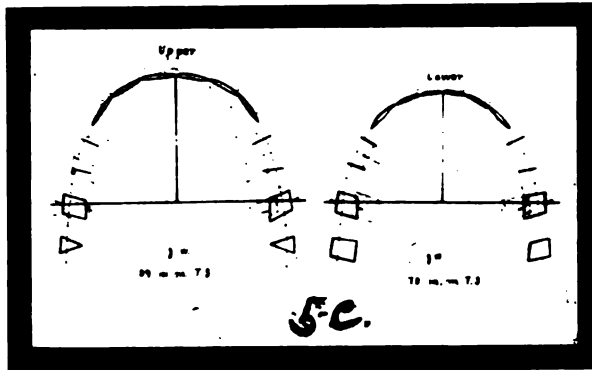


Fig. 5C shows surveys of both upper and lower arches of the case, tooth substance upper arch 89 mm., lower arch 78 mm. Note on the upper survey the fact that the tooth movement required is all on the left side of arch. The cuspid instead of being outstanding is in the arch line, but it requires distal movement. The lower arch requires movement on both sides, but the movement required is tipping, not bodily movement.

To prove that my orthodontographic surveys are correct, I will present four surveys of Nature's normal arch.

Fig. 6A shows the occlusion of Nature's work.

Fig. 6B shows the palatal view of the same case. Note the right cuspid just erupting through the gum.

Fig. 7A shows another one of Nature's perfect arches.

Fig. 7B shows the palatal view of the same case.

Fig. 8A shows surveys of four of Nature's normal arches, superimposed upon the orthodontographic normal arches of the same tooth substances. The survey 7A is a survey of the model 7A; note the slight movement of the first and second molar on the left side, due to extraction of the left lower first molar. 6A survey is a survey of model 6A.

#### CONCLUSIONS

1. The orthodontographic survey gives a positive diagnosis.
2. Symmetry and asymmetry of the arches are obtained by the superposition of the proposed normal over the abnormal survey.
3. The drifting (mesially) of molars is correctly shown.
4. Conveys a definite diagnosis to patient.
5. Facilitates the designing and construction of apparatus, correct and complete for carrying the case through.
6. It is the medium by which we obtain a continuous checking up in the progress of the operation.
7. It definitely establishes the completion of the operation.
8. It clearly indicates singly or ensemble any recurrence of malocclusion after dismissal.
9. It permits the continuity of work without duplication or chance of error upon a patient changing his residence.

#### DISCUSSION

*Dr. Harold De W. Cross, Boston, Mass.*—The remarks which I shall make relative to the subject of the evening bear entirely on the phase of occlusion rather than orthodontia, and my interest in occlusion is my reason for appearing in this discussion. I believe the plan of orthodontographic survey supplies a simple and accurate means of obtaining definite results which can only come from some method of advance knowledge. Heretofore there has been, as you all know, more difficulty in knowing definitely *where* and *how much* to move teeth rather than *how* to accomplish it.

The orthodontographic plan recognizes "occlusal" features; that is, the proper relation between the superior and inferior cusps, the inclination of the cusps, the overbite, and the antero-posterior bite and compensating curve, etc. Comparatively few orthodontists have given much attention to this, which to my mind is largely responsible for the difficulty of movement and the failure to retain teeth in their new position or to provide suitably for mastication when the case is completed.

The advantage of anatomic occlusion applied to orthodontic work was called to your attention some twenty years ago in a paper read by me before this society (here a reference was made to a specific case of a dental student's occlusal relations.)

The essayist referred to a case of excessive overbite corrected by straightening up bicuspids and molar. To one familiar with anatomic occlusion, this appears very simple and causes one to wonder why these principles are not applied to all cases of malocclusion. It is possible to look on irregular teeth merely as a set of artificial ones which are to be "set up" according to the principles of anatomic or normal occlusion.

To become convinced of the possibilities of the rearrangement of irregular teeth it is only necessary to try cutting off the teeth on a plaster cast, obtaining the angle of the condyle path from the head and set them up "anatomically" when it will be seen that

It is possible to arrange any teeth, however irregular, so that they will act with a reasonably normal occlusion.

Normal occlusion allows equal strain to be brought on all of the teeth and the same equalizing which protects a porcelain facing prevents the occlusion from driving a tooth out of position if it is correctly placed, and is of assistance in moving the tooth into its suitable and proper position.

Normal arrangement of the teeth in the arch recognizes anatomical features, including the condyle path, compensating curve, overbites, front bites, inclination of molars, and occlusal position of cusps of superior and inferior; and these things are worthy of much attention from an orthodontist's standpoint.

There may be other ways to check up or determine the "normal" features other than by trial of the side and front articulation, and it is quite possible that the orthodontographic survey is the answer.

*Dr. W. H. Gilpatric.*—I have previously mentioned that I have nothing to sell nor am I here to demonstrate my mechanical method of applied orthodontia. What I am offering is: means to perform and follow a more intelligent course in the practice of orthodontia. A simple parallel: a physician diagnoses a case with some assurance, he takes into consideration the unexpected and prognoses the case. The orthodontist diagnoses the case empirically and assures the family of the patient that he will do his best, of which there is no doubt. But "his best" is indefinite.

Can it be doubted that having a plan and delineating the proceedings we can not prognose? We can, because we know what the normal arch is, and we know that a number of teeth of a certain size can be arranged on an occlusal line, contact point to contact point, only in a manner that will be normal.

As I have mentioned before, if arranged in any other manner it would quickly show a contracted or expanded arch in the molar region promptly denoting malocclusion and facial deformity. The discussion that preceded, has not in any way attacked the method of prognosis, it simply asserted that it can not be done. Dr. Delabarre asserts that merely to establish occlusion in a malformed arch is not sufficient. Granted, but will he not be helped by knowing when he has established occlusion and normal functioning of the teeth, in passive and active cusp and inclined plane relation? The example of a whole masticatory apparatus being protruded or lowered six inches is absurd. If such a monster would persist in living, his very existence would demonstrate that Nature has accommodated all members for performing their function, and if occlusion could not exist, it could be restored just as correctly so far as the method of predetermination advocated tonight deals with set factors; the sum total of the mesio-distal substance of teeth at contact points. In mixed dentures the table of averages as given by Black has proved so far to be correct, and they form the basis of our measurements for predetermination of the future arch (averages between temporary and permanent).

Regarding the hundred thousand cases to demonstrate my assertions, this is unnecessary and useless. The law of averages clearly established that one hundred cases is a good indication—one hundred individuals taken at random will demonstrate any given premise. I have used my surveys on four hundred cases and the results have been satisfactory, I am, therefore, bound to state, and am convinced, that my conclusions are correct.

Dr. Rogers tells us that the biological factors are the most important in the correction of malocclusion and that as every individual presented for correction shows specific conditions, it would be fallacious to think that an arch could be predetermined as long as the unknown factor causing it can not be found. He also asserts that the patient must be considered as a whole and that his general welfare must be considered, his upbuilding. Medical authorities state that we are not congenitally perfect. Therefore the biological factors have continued to perpetuate themselves in different individuals, in diverse abnormalities of construction and function, in our case, in jaws and teeth; also in acquired habits which may or may not be transmitted.

The orthodontist, while not restricted to orthodontia only, should not perform the offices of a professor of calisthenics with reference to the general welfare of the patient, to establish all the biological factors in the new generation would, in ultimate analysis become a function of the State Department of Health. This ideal condition is desired by all men of science who are striving for perfect society. Surely orthodontia has a great deal to do with the development of the brain by enlarging the sinus, reestablishing normal breathing, correcting and helping the reestablishment of facial lines to produce harmony and symmetry in the individual. The biological factors in a present specific individual are es-



tablished through generations, and if abnormalities are shown as compared to an ideal standard is it not also true that abnormality is nearly normal to that individual inasmuch as it performs its function and that the metabolism is complete?

That brings us to the conclusion that orthodontia has to deal with normality and abnormality only as it refers to functions of the masticatory apparatus and its correlated parts, the muscles of expression, mastication, and digestion. Good digestion and better facial lines are results and not causes of normal occlusion, and the orthodontist need not search for prehistoric changes, inasmuch as the changes are evolutionary and the changes from one generation to another are imperceptible.

Dr. Rogers refers to his specific study, calisthenics of the muscles of the head, and appears to consider this as the paramount factor in orthodontia. This undoubtedly helps, but the predetermination of arch will in no way disarrange his principles; on the contrary, it will help him in knowing much better the direction in which the teeth should be moved in order to reestablish the normal function of the muscle.

Dr. Baker opened his discussion by showing four abnormal arches with their full complement of teeth. These arches were drawn fifty or more years ago by an artist who attempted to represent an idea conceived by an anthropologist, and to demonstrate the contentions of Broca that an abnormal cranium is related to an abnormal arch.

How is it possible for me to predetermine a normal arch from a free-hand drawing?

Some of us are endowed with the gift of mind-reading. I am not, and can not see what Dr. Baker had in mind when he screened four free-hand drawings of abnormal arches belonging to four abnormal heads which did not exist, except in the mind of Broca, and were drawn to illustrate a debatable theory. These drawings have no standing in orthodontia.

Dr. Baker said that science was cold. Science is not cold, it is exacting. It wants the truth in all its relations. Deductions under scientific guise by analysis from imaginary conditions are not scientific. The other slides on the screen demonstrate only how much he can accomplish when he stops in his mechanical pursuit and allows Nature to take the case in hand and finish it for him. As Dr. Rogers remarked the muscles of the face were not in normal relation and functioning so as to give the patient a normal face.

In conclusion I will state that I stand ready to demonstrate the soundness of my principles through a test with finished cases and Nature's normal arch, said cases to be furnished by your committee.

The models of the cases shown are in my office, and open to inspection at any time.

## WHAT ARE WE DOING TO JUSTIFY OUR EXISTENCE?

BY C. H. JUVET, D.D.S., OTTAWA, CANADA

TO repay the heritage that is ours to cause posterity to feel thankful that we passed through the cycle of existence."

This quotation from a letter published in *Dental Items of Interest*, November, 1918, I consider well worth the serious consideration of the members of the dental profession.

In assuming the responsibility for the preparation of an article on the subject of orthodontia, it has not been my intention to presume to tell you anything you do not already know or have not already learned, but to refresh your memory, and endeavor to draw to your attention the importance of a greater interest in the department of orthodontia by the members of the profession of dentistry, and also, to impress on you the importance of advising parents of the necessity for the correction of abnormalities early in life, so as to obviate complicated treatment which is sure to follow when cases are neglected until such time as all the permanent teeth have erupted.

When the subject of prevention is being given so much consideration, it might not be out of place to inquire how much thought is being given to preventive orthodontia.

How many of the members of our profession are able to tell a normally developing arch of a child of, say, six years of age, and one that is not developing normally?

Dr. E. A. Bogue of New York City has carried on investigations on this subject for a number of years, and he published the results of these findings in the *Dental Digest* in 1912-13 in which he says, if at six years of age, the temporary, or baby teeth, still remain perfectly regular and close together, the prognosis is clear that the permanent teeth, which are to succeed these regular baby teeth, will inevitably be irregular.

Dr. Bogue further states that the normal child at three and a half years of age should have an upper dental arch of at least 1.10 inches lateral width in the temporary molar region. He also states that if at four or five years of age the temporary dental arch in the molar region is not more than 1.10 inches wide, the diagnosis is positive that there exists an arrest in the child's development which it will not outgrow unaided.

The results of Dr. Bogue's findings should be carefully studied by the members of the dental profession so as to be able to distinguish normal development from the underdeveloped cases of children coming under their observation every day.

Members of the medical profession, as well as the dental profession, have many children under their observation every day who are not advised of the necessity for early treatment as often as they should be.

Parents are presenting themselves almost every day with the information that they had applied for the correction of a noticeable irregularity when the

child was quite young and were advised to defer the treatment until the child was older or until all the permanent teeth had erupted. If the members of the profession who give this advice were willing to assume the responsibility for the correction of these deferred cases, it would not be so important; but, when neglected until the case has assumed such proportions or difficulties as to be almost impossible of correction, parents are then informed that the patient has reached a suitable age, or perhaps, as it more often happens, the parents take the matter into their own hands and seek the advice of someone else who



Fig. 1.



Fig. 2.



Fig. 3.

then has the painful duty of informing these patients that, being responsible for the treatment and results, he would have much preferred to have undertaken the treatment at a much younger age, as he would then have been much more assured of a permanent result than can be expected at the patient's present age. The advantage of correcting cases in younger children is that when treated young there is no abnormality present in the majority of cases, but simply a lack of development of the arches which is often very readily overcome. If treatment is delayed until the patient reaches the age of twelve or fourteen, there is an abnormality to correct, and the muscles and features have been so influenced by the underlying tissues, that the abnormal action, like a bad habit,

long persisted in, is harder to overcome. If the members of the profession would only get the idea fixed in their minds that in the majority of cases we are not correcting irregularities of the teeth, but underdevelopment of the arches or jaws and that the teeth are only used as a means to an end, and dealing with bone tissue as we are, would appreciate the fact that bone tissue is much less resistant at seven years of age than it is at twelve, it would help very materially in getting the proper view and the desired results.

When this point is understood and firmly fixed in the minds of our profession, we will see fewer irregularities or hideous specimens of neglect walking the streets of our cities. We can conscientiously say that a great many of these



Fig. 4.



Fig. 5.



Fig. 6.

conditions could have been prevented if the members of the profession had taken a greater interest in orthodontia and had realized the responsibility of their position and the duty they owe their little patients in pointing out to them these defects early in life so that they might have them corrected while the opportunity for correction is possible and assured. The members of the dental profession should shoulder their responsibilities, and not wait for the other fellow to do it for them.

Figs. 1, 2, and 3 are the front, and right and left side views of casts of a boy taken at 7 years of age. The right and left lower central incisors and right lateral incisors have been lost, and the two permanent central incisors are erupting

in their places, but of such proportions that they almost entirely fill the space previously occupied by the three temporary incisors.

One will also notice that there has been no development taking place to accommodate the larger or incoming second teeth, as there is no separation or spacing of either the upper or lower teeth. One will also notice a normal mesio-distal relation, or neutroclusion. Figs. 4, 5, and 6 are casts made of the same mouth at thirteen years of age where one will notice that there is a unilateral distoclusion on the left side and a tendency to a similar condition on the right side which I firmly believe will have resulted when the left upper cuspid further erupts.



Fig. 7.



Fig. 8.

Figs. 7 and 8 are palatal views of the same case at seven and thirteen years of age.

Measuring between the temporary molars at the gum margin of the model shown in Fig. 7 was found to measure 1.04 inches at seven years of age when he should have had a development of at least 1.10 inches at four years of age.

When the model shown in Fig. 8, which is a cast of the same case at thirteen years of age, was compared with that shown in Fig. 7, it was found that there was a development of 1.14 inches, or only .04 of an inch development more than he should have had at four years of age.

As already expressed, in the majority of cases presenting early in life, there is only a lack of development to contend with, whereas if the case is left

until later in life, or until the child has reached the age of twelve or fourteen complications arise such as the distoclusion presented in this case, and I have every reason to believe that if this case had been treated at seven, this condition would not have developed, and it would have been easily corrected by simply stimulating a normal development.

This conclusion is formed from the fact that the boy has only been wearing appliances for about six months, and I have only seen him three times, or, rather, modified his appliances three times, and the lower jaw is moving forward into normal occlusion without any other influence being exercised than a stimulation or expansion to normal development.

Figs. 9 and 10 are lingual comparisons of the same case at seven and thirteen years of age. These illustrations should be sufficient to demonstrate



Fig. 9.



Fig. 10.

to any one the necessity for early treatment in these underdeveloped cases, and the complications likely to arise when early treatment is not undertaken.

Prevention, rather than a cure, is quite as applicable to mouth conditions as other parts of the body.

It is, therefore, important that the general practitioner should be possessed of sufficient knowledge in the department of orthodontia so as to be able to distinguish between an arch that is developing normally so as to be of sufficient proportions to accommodate the larger incoming second or permanent teeth and one that is not properly developing.

If the members of the profession can be brought to a realization of the responsibility that is theirs, the purpose of this short article will not have been in vain.

## HISTORY OF ORTHODONTIA

(Continued from page 544, Vol. IV)

By BERNHARD WOLF WEINBERGER, D.D.S., NEW YORK CITY.

**E**UGENE S. TALBOT, M.S., D.D.S., M.D., D.Sc., LL.D. 1847.—In the *Dental Cosmos* of 1881 we find the first article on *The Regulation of Teeth by Direct Pressure*, written by Talbot. From that time until the present, his articles are scattered throughout the dental and medical journals, those presented before societies prior to 1888 were incorporated in his first work—*Irregularities of the Teeth*. This book has passed through some half a dozen editions and a great deal of material which is included was never presented in the dental journals or before societies.



Fig. 1.—Eugene S. Talbot, M.S., D.D.S., M.D., D.Sc., LL.D.

Talbot's (first edition) work while covering the usual subjects of anatomy, etiology, development, etc., included some subjects heretofore but slightly treated. He approached the question of etiology of malocclusion from a standpoint not previously known and in the fourth edition we find the following:

"The unwritten law in general medicine, 'that to know the cause is half the treatment,' is also applicable in the treatment of deformed jaws and irregular-

(Copyright, 1918, by Bernhard Wolf Weinberger)

ities of the teeth. Without the knowledge of etiology no one can successfully correct deformities as is evident in the many failures by men who profess to make this a specialty."

He has confined himself entirely to his own appliances and methods of treatment. "Systems" in the ordinary charlatan-like sense are not accepted as guides. In the author's opinion the practitioner should be familiar with the etiology of the case in hand; his knowledge of principles and mechanics should suggest to him the most suitable appliances for the given case. Every force has its place in the treatment of these deformities.

In the second edition we find the following:

"Health of the body, like that of the mind, depends largely on the proper performance of the various bodily functions. The kind and degree of functional activity must be suited to the individual. When this accord exists we have happiness of mind and health of body. In a recent article in a medical journal, the baleful influence of idleness in prison life is discussed. It is stated that the consequences of the labor law of 1888 were the increase of insanity, a higher death rate, a shattered morale and an unprecedented deficit in the sum total of earnings as compared with expenditures. This illustrates a far-reaching principle. Not only is activity necessary to the well-being of the individual as a whole, but to every organ. Excessive action or impaired function imply disease. The stomach, if overloaded or required to digest unsuitable food, becomes enfeebled. Every organ depends for its integrity immediately on the nervous system. When nervous activity is impaired or lacks balance, the general balance of function is disturbed. Nowhere are results of this lack of equilibrium more visible than in the teeth.

"Malnutrition resulting from disease, from insufficient or unsuitable food and unhealthy environment, is the cause of idiocy, insanity, blindness and other defects. Derangement of the nervous system usually underlies these conditions as found among the poor. But there is another class of individuals who suffer from neurotic conditions. They are those who are well fed and housed, but have overtaxed their nervous systems by improper modes of life and various forms of excitement. The two classes have this in common, that the functions of the nervous system are impaired, and they show similar results of defective nutrition. This want of balance produces an osseous system that shows excessive development in some of its parts, and arrested development in others. Nowhere is this more manifest than in the maxillæ. Thus we have the causes of constitutional irregularities established. We see the disturbances of the functions of the organs of the body as a whole result in constitutional irregularities. The impairment of the function of the teeth themselves gives rise to local irregularities. The importance of the correct performance of the function of these organs will be seen from a brief consideration of the results of the impaired activity.

"1. Teeth to be clean must be used. When one-half of the arch alone is in use, the other half shows an unusual deposit of tartar, with hypertrophy of the mucous membrane and gums.

"2. The development of the alveolar process depends on the use or disuse



of the teeth. When the bite is too close in the posterior portion of the arches, an effort is often made by Nature to correct this by lengthening the process in the anterior part. Cases of anterior protrusion afford study of these conditions. When forced to perform an abnormal function in these cases excessive development results.

"3. Not only does the alveolar process lengthen when not in use, but individual teeth elongate as well when deprived of their antagonists.

"4. Nowhere does interrupted function produce more mischief than in the derangement of articulation. The function of every individual tooth is indicated by its form. This shows that it should touch at certain points and antagonize at others. There is a certain degree of motion perceptible only by its effects. When the support of a tooth is withdrawn by the extraction of its neighbor, this motion is no longer sufficiently restricted, and there is more or less migration or tipping. The basilar ridges of the anterior teeth, and the cusps of the posterior, are resting-places for their antagonists. Let this support be taken from one or more teeth, and their function is destroyed in part and their health impaired."

In order that our readers have some idea of the scope of this volume a portion of the contents of the fourth edition is given: Seventeen pages are devoted to History, followed by Heredity, Congenital Factors and Maternal Impressions, Post-Natal Skull and Jaw Development and Periods of Stress, Development of the Cranium and Face, Development of the Jaws, Development of the Alveolar Process, Development of the Vault, Development of the Peridental Membrane, Development of the Teeth, Social Consanguinity, Near-Kin, Early and Late Marriage, etc. The practical subject, which includes appliances, is not reached until the last chapter, under the head of Surgical Corrections, and this covers forty-four pages. It will thus be seen that the author has not regarded as of much importance the mere description of cases or the preparation of appliances used.

In the chapter on the Development of the Jaws, this curious fact is stated presumably on exact measurements. "The lateral diameter of jaws of existent races in Europe is greater than of the same races in America. \* \* \* The jaws in older parts of the United States are smaller than jaws in the newer. The differences between jaws of the residents of Boston and those of Chicago are thus in evidence. Presumably it is to be inferred that the farther west the child is born there will be a proportionate increase in the diameter of the jaw; a discouraging fact, if it be a fact, for those born on the Pacific coast, as they will rapidly develop into the large jaws of the American Indian."

The author discards "dome," "palate," and "arch," in speaking of the roof of the mouth and adopts the word "vault." This includes the hard palate, the soft palate, and the alveolar process.

Though Dr. Talbot may not have made great contributions to orthodontia from the mechanical treatment of irregularities, his extended researches of over forty years have, however, produced results which have had a great deal of influence in advancing both the science and practice of our specialty. Along the line of evidence of maldevelopment, Talbot observed that which he called degeneracy but undoubtedly in the future will be recognized as disturbances of

the internal secretory glands. Of his own devices he described and illustrated his coiled springs, jackscrew, etc., for expansion of the arch or for movement of the individual teeth. He also advanced and advocated surgical correction by removal of the alveolar process and tissue in the path of moving teeth.

Returning to the journal articles of Talbot in 1881 we find him using the jack-screw as shown in Figs. 2, 3, 4, and 5, the use of which he describes in the following manner:

"I secured a jackscrew of the proper length firmly to the canine upon the right side, allowing it to come in contact with the tooth I wished to move—the bicuspid of the opposite side. When this was forced laterally sufficiently, I removed the nut on the end of the screw and replaced it with a wedge, which

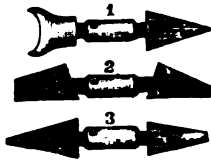


Fig. 2.—Jackscrews as described by Talbot.



Fig. 3.—Jackscrews applied to a case.

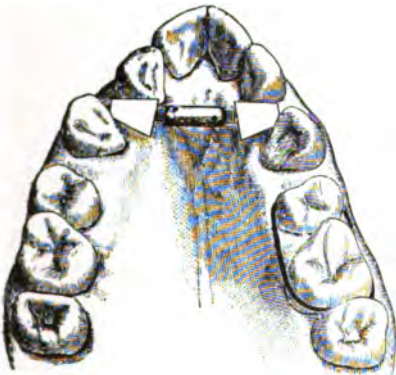


Fig. 4.—Jackscrews applied to a case.

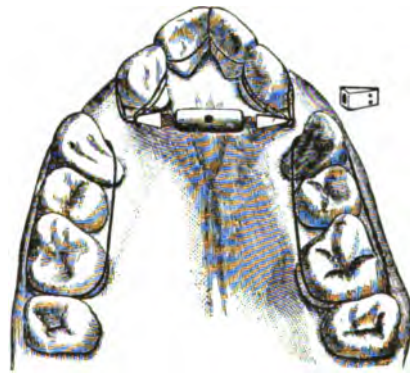


Fig. 5.—Jackscrews applied to a case.

was inserted between the bicuspid and the canine. The canine being firm and inflammation having been already produced around the bicuspid, it yielded readily to the powerful pressure of the screw and wedge. When this had proceeded as far as possible, the wedge was removed and a thicker one substituted. As soon as the tooth reached the molar, it was secured to it by ligatures and so held in place. I fastened my jackscrews firmly to the canines and forced them laterally until inflammation set in. Wedges were put upon either end of the screw, inserting them between the canines and lateral incisors. The laterals being solid, acted as fulcrums, and the canines were easily forced into place.

These were then fastened by ligatures. To move the lateral incisors I employed a short screw with wedges, in which holes had been drilled. To each central I tied a linen thread, carrying it around the lateral, over the end of the wedge on the screw, and passing it through the holes, tied it fast. By turning the screw the laterals were not only forced outward, but were rotated in their sockets. When this was accomplished, I fitted a plate to retain the teeth in place and also to draw the centrals back into the arch. This was done by running a piece of gold wire across the labial surfaces of the centrals, from which a rubber band was carried posteriorly to a loop in the rubber plate. As soon as they reached the proper position, another plate was inserted with a gold band passing over the outside of the teeth to hold them in place."

In the *Dental Cosmos* for May, 1885, Talbot introduced coiled springs under *Dental Regulating Apparatus*, as follows:

"In many operations designed for the regulation of teeth, one of the first and most difficult things to be done is the spreading of one or both of the dental arches, and usually much time is consumed in efforts to obtain a fixed point from which movements may be made. The jackscrew is a positive and simple device, but it can not be used from side to side of the inferior maxilla because of the intervening tongue; it also interferes greatly with vocal articulation, if so adjusted as to span the palatine arch, and as the majority of cases to be regulated are those of children in attendance at school, they must thus be either kept out of school or be subject to great annoyance from the jackscrew impediment.

"The Coffin cleft plate is an improvement in comparison with the jackscrew, but likewise interferes with the tongue if used on the inferior maxilla; and when applied to the superior maxilla the complex character of the spring makes the fixture difficult to adjust in such relations that the expanding force shall be exerted in directly opposite directions, the spring having usually a tendency to thrust the plate out from the mouth; and, in cases where the teeth are not fully erupted, it is extremely difficult to retain such plates in position.

"An appliance by which I have obtained the most satisfactory results, with a minimum of hindrance or discomfort to the patient, will be described with reference to the accompanying illustrations.

"One appliance shows a spring made of piano wire, coiled three times around a mandrel of the same or a little larger wire, and then bent down so that the arms will be in the same horizontal plane.

"On an exact plaster model of the case to be regulated a thin, narrow vulcanite plate is formed, with a short vertical post fixed, either before vulcanizing or afterward by drilling, centrally in the plate on the median line. Grooves or slots are, with a wheel bur, cut in the sides of the plate to receive the ends of the spring and prevent its displacement after the coil has been placed on the post. Fig. 6 represents such an appliance in position on a plaster cast of the inferior maxilla, and it will be thus seen that the movements of the tongue would not be, as in practice they were not, seriously restricted. For the superior maxilla the plate is of like construction, and in some instances may be ligated to the teeth. The tension of the spring is changed by simply bending outward or inward its arms, and in many cases the apparatus may be inserted

or removed with great facility, and its action be so continued and controlled that the required expansion may be obtained and maintained by the use of but one plate. In occasional instances the plate may be dispensed with, and by the judicious use of ligatures the spring-arm may be attached directly to the teeth to be moved, while the coil is likewise fastened to the front teeth."

Fig. 6 is taken from his article, *Spreading the Dental Arch*, *Cosmos*, 1886, page 19, and is a modification of his previous regulating apparatus and needs no further description.



Fig. 6.—Plate vulcanite, with coil in place.

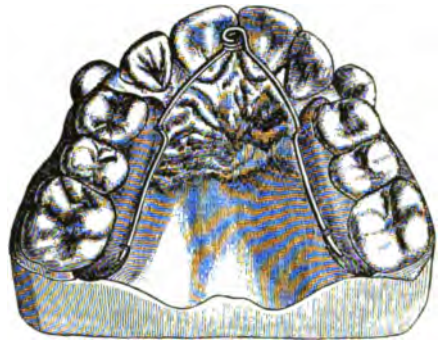


Fig. 7.—Appliance for expanding superior maxilla.



Fig. 8.—Expanding the superior lateral.

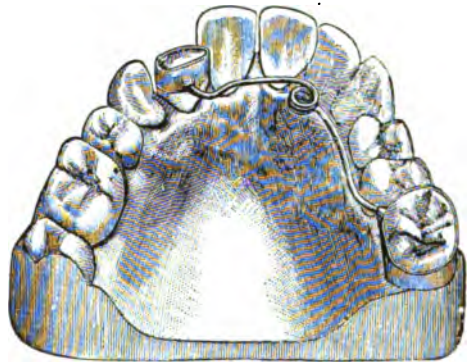


Fig. 9.—Method of moving individual teeth by coiled spring.

Fig. 7 is to be found on page 97 of the same journal, while Fig. 8 illustrates Talbot's method of expanding the superior laterals.

"Thin platinum collars were made to fit the laterals, on which, after drilling a hole in the side of each collar, they were firmly fixed with oxyphosphate of zinc. A Norton-Talbot spring was bent into the form shown, the ends of the arms being turned at a sharp angle and cut short as seen in the figure.

"The spring was then put in place, the arm ends entering the holes in the collars, and the curved arms found to be so closely conformed to the surface of the gums and palatine parts that the fixture was no obstruction to occlusion, and yet could be easily sprung out of position for cleansing purposes or for increas-

ing the expansive power of the spring, by simply widening the lateral spread of the arms.

Fig. 9 shows another method of moving individual teeth.

"To force out central and lateral incisors, I have found the following methods useful: Around the tooth to be moved, and around the molars as nearly opposite the direction the incisor is to travel as possible, fit platinum collars. Solder cups upon the collars directly opposite and in line. Make a spring of piano wire, and spring it into the cups soldered upon the collars."

In regard to the extraction of the sixth-year molar, Talbot in the *Items of Interest* for 1888, page 12, says:

"If the temporary teeth are extracted, the first permanent molar will work forward and fill the space intended for the bicuspid tooth. In other words, the central incisor, lateral incisor, cuspids, temporary molars, and the six-year molar, will all be in the jaw. If at the same time, from decay or other cause, the second temporary molar is removed, the first permanent molar will work forward and fill the space of the second temporary molar.

"This will be better comprehended when you go home and examine the models and mouths of your patients. It will be seen that if the teeth have been removed on one side, the molar has worked forward from an eighth to a quarter of an inch, or as far as the crowns of the bicuspids. I have tried it time and again and it is invariably the same. If you will take your rule and measure from the middle line to the anterior surface of the first permanent molar, you will find that the space is narrower from the middle line to the anterior point of the first permanent molar by an eighth of an inch than on the other side of the jaw where the temporary molars are in place. When we consider how many of the temporary teeth are prematurely extracted, we need not be surprised at the number of irregularities of the teeth. It is quite common to find this condition.

"In regard to the extraction of the sixth-year molar, I do not believe in the extraction of any teeth except in extreme cases. If we have the first permanent molar decayed to such an extent that the pulp is dead, and the roots are not properly formed so that they can be filled, that tooth should be removed. In some cases this will correct the irregularity, but will not serve for all, because the permanent teeth have a tendency to work forward to fill the spaces so that the other teeth can not come through.

"Another irregularity which is quite common is where the permanent cuspid has pointed up on the outer side of the alveolar process. It is quite common to find the first bicuspid tooth worked forward to such an extent that the permanent cuspid can not come down into place, and the cause of that is extracting the temporary cuspid tooth. Then often, if the arch is large, I agree that the first bicuspid should be removed, that the cuspid tooth may come down into position."

It is in the July number of the *Cosmos*, 1888, that we find Talbot seriously considering the *Etiology of Irregularities of the Teeth*. He treated the causes under the following sub-heads: *Arrest of Development of the Superior Maxilla.—Consanguinity in Its Relation to Deformities in General.—Scrofula.—*

*Drunkenness in Parents.—Pre-Natal Influence and Intra-Uterine Education.—Report of Cases of Arrested Development and Excessive Growth of All the Tissues, in Connection With Idiocy, Imbecile and Feeble-Minded Children.—Abnormally-Shaped Heads,* and concludes his article with this résumé:

"1. Irregularities of the teeth can not be justly said to be of congenital origin, since they do not exist at birth.

"2. Irregularities of the teeth can not occur until they have erupted, and thus show their relation to each other and to the jaw.

"3. Irregularities of the teeth which I have denominated constitutional prevail to a greater extent among the idiotic, deaf and dumb, and blind, than among an equal number of strong and healthy persons.

"4. It may be seen that not only is the brain matter deficient in the feeble-minded, but, as I have noted, many cases are seen which demonstrate that the osseous system is also generally defective.

"5. Arrest of development is the result of malnutrition during embryonal and infantile growth, influenced by consanguineous marriages, scrofula, drunkenness in parents, prenatal influences, intrauterine education, and constitutional diseases, or of inflammation of the osteophytic membranes in utero.

"6. Irregularities of the teeth do not exist among normal or large jaws, while among those who have abnormally small jaws, the majority have irregular teeth.

"7. When premature ossification of the sutures at the basis cranii takes place, the anteroposterior diameter is shortened, producing arrested development of the superior maxilla.

"8. When the bone tissue is arrested in development from malnutrition, the maxillary bones are also affected.

"9. When arrested development of the superior maxilla occurs the face often presents a sunken appearance at the angle and root of the nose, with the nose broadened and the inferior maxilla prominent.

"10. In another paper I shall attempt to prove that the irregularities of the teeth called constitutional are the result of small maxillæ, and that Dr. Hammond's future man will not only lack hair and teeth, but the superior maxilla will gradually decrease in size and eventually become rudimentary."

This article was continued under the following subheads:

*"Arrest of Development of the Maxillary Bones Due to Racecrossing, Climate, and Soil.—Climate and Soil.* (Subhead II, page 533.)

"From the foregoing it seems legitimate to draw the following conclusions:

"1. The same influence which produces the small jaw in the idiot, deaf and dumb, and blind, will also produce the small jaw in strong-minded individuals.

"2. Heredity and conditions of life can give rise to a variety, and as the individual that has begun to deviate from the type becomes in its turn apparent, tending to transmit to its offspring the exceptional characters that distinguish it, the variations become more marked in the offspring, and heredity transmits the sum of these variations to the following generation.

"3. Irregularities of the jaws and teeth are not found in pure races nor in aborigines.

"4. Irregularities of the jaws and teeth are common in mixed races, and more common in the offspring of races differing widely from each other.

"5. Such irregularities are not the result of high and selective breeding, since such breeding obtains only in pure races and aborigines, in which the irregularities are not found.

"6. Conditions of life, climate, soil and food play an important part in irregularities of the jaws and teeth, when taken in connection with race-mixture.

"7. In older parts of new countries in which a number of generations have lived, small jaws and irregularities of the teeth are more numerous than in the newer parts of new countries.

"8. The shape as well as the size of the head has much to do with the shape of the jaw.

"9. The prognathism of the jaw increases with the age of the individual. It is, however, sometimes a natural growth, as noticed in the negro, and is characteristic of that race. In the American race it is due mostly to local causes."

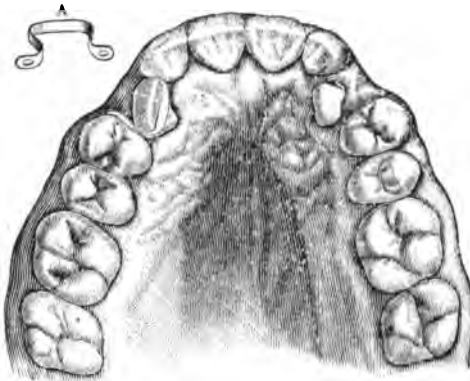


Fig. 10.—Method for compulsory eruption of cuspid.

*"Arrest of Development and Excessive Growth of the Maxillary Bones."* (Subhead III, page 630.)

*"Development of the Inferior Maxilla by Exercise, and a Symmetry of the Lateral Halves of the Maxillary Bones."* (Subhead IV, page 693.)

*"Asymmetry of the Maxillary Bones."* (Subhead V, page 783.)

*"The Alveolar Process.—Hypertrophy of the Alveolar Process."* (Subhead VI, page 876.)

*Dental Cosmos, 1889, "The Origin and Development of the V- and Saddle-shaped Arches, and Kindred Irregularities of the Teeth."* (Subhead VII, page 1.)

*"The Origin and Development of the V- and Saddle-shaped Arches and Kindred Irregularities of the Teeth."* (Subhead VIII, page 98.)

Under *Compulsory Eruption of the Teeth*, *Dental Cosmos, 1889, page 352, Fig. 10*, explains Talbot's methods. Fig. 10 shows an appliance made of German silver, which possesses all the requisite qualities. I have three thicknesses of it ready for use, Nos. 29, 31, and 32, U. S. gauge. Strips are cut one-sixteenth to one-eighth of an inch in width, according to the strength required, and bent



with small round-nosed pliers into the shape represented at *A*, to fit the teeth. This is removed "every day, and with round-nosed pliers the ends are bent, the springs shortened, and forced to place upon the tooth. This little spring acts in two directions: (1) to carry the teeth laterally and thus provide room, and (2) to draw the irregular tooth into position. This appliance can only be used when the crown of the irregular tooth is fully erupted. Teeth situated outside the arch may thus be brought into line as well as those which are situated inside. In the latter case it is necessary to wear a plate to keep the jaws apart while the tooth is in transit."

In 1889 *Cosmos*, page 762, Talbot introduced a "*Classification of Typical Irregularities of the Maxillæ and Teeth*."

"All irregularities of the maxillæ and teeth may be traced to the following causes:

"I. Constitutional: malproportion and malrelation of the maxillæ due to excessive or arrested development.

"II. Local or circumstantial:

- (1) Improper occlusion;
- (2) Want of accord between waste and repair;
- (3) Neglect of function.

"These causes are deviations from the general laws that govern the healthy relation and function of the teeth:

1. A proper relative size of the organs of mastication;
2. A proper occlusion of the teeth;
3. Accord between the processes of waste and repair;
4. Proper functional activity.

"These form the basis of the classification adopted."

In the *Dental Cosmos*, 1890, page 185, Talbot wrote the following: *On Making a Diagnosis of a Case of Irregularity*.

"Irregularities have been divided into constitutional and local: the former affecting the body of the bone, the latter being accidental, affecting the teeth and alveolar process.

"Frequently when a case of irregularity is presented we can tell by the general contour and profile of the face whether the case is one of the constitutional or local type, the external proportions being affected by a decided V-shaped arch, excessively developed alveoli, or underhung jaw. One of the first things a dentist has to learn is to observe carefully. In determining the correctness or incorrectness of the outline of the mouth and jaw, he instinctively takes it in as a whole, on the same principle that when we look at the picture of a friend we decide at once whether it is a good likeness or not, reserving our judgment on particular points until later.

"Observe each jaw. See whether it has a normal outline or whether it belongs to the V-shaped or saddle-shaped variety; this will help you to decide about the appliance to be used.

"Now comes the important feature of a correct diagnosis. Examine the



occlusion, letting the patient open and close his mouth slowly. No detail must go unnoticed. The beginner should familiarize himself with the individuality of each class of teeth both as to outline and occlusion. For this purpose he is advised to study the very excellent article by Dr. E. T. Starr and F. L. Hise, in the August number of the *Dental Cosmos*, vol. XXXI.

"When there is an asymmetry of the upper and lower jaws, one being larger than the other, the occlusion from the cuspid back is usually wrong. In such cases it generally strikes in front of the lower cuspid instead of between it and the bicuspid, disarranging the articulation of every tooth back of it. We can not stop here to speak of the different forms of malocclusion; the dentist who never ceases to be a student will see these for himself.

"The difficulty in local irregularities is usually easily detected, for it is found either in the alveolar arch or in the malposition of individual teeth.

"Before giving your opinion, inquire into the family history. Dr. Kingsley justly remarks that it is useless to try to correct an irregularity peculiar to a family type: nature reverts to her original design notwithstanding long-continued efforts. For this reason it is usually well to wait until the patient is of an age when it can be determined what permanent form the jaw will assume.

"When the arch is overcrowded and can not be spread, or when it protrudes and the extraction of one or more teeth appears advisable for the purpose of obtaining space, care should be exercised in deciding upon the right ones. Examine to see which teeth are carious or diseased. Do not extract a first molar if it can be preserved with comfort to the patient. The cuspid is the most important tooth in determining the outline of the wing of the nose and upper lip and giving character to the face; for this reason never remove it when avoidable.

"Eighteen years of experience in the correction of irregularities of the teeth and a practical knowledge of the laws of mechanics have taught me not to rely on any particular appliance. Frequently, though a certain appliance has worked well in one case it may not be efficient in another case of a similar nature, and not infrequently two or three of the different forces are tried before one shows itself effective, this being due to the unknown factor of resistance which can be determined only by experience."

In the conclusion of his paper, entitled *The Differentiation of Anterior Protrusions of the Upper Maxilla and Teeth*, Talbot says:

"It will be seen from a comparison of these six forms of anterior protrusion, that the phenomena that strike the casual observer as very similar are due to what I have termed constitutional causes, that is, an ill-balanced osseous system; the last is generally ascribed to diathesis, while the four remaining forms are accidental. In the first form the osseous system is affected, in the rest the alveolar processes and the teeth. Owing to these facts, in only the first form does the lower maxilla partake of the defect, while in the rest its form is independent,—that is, it may be normal, or subject to excessive or arrested development. For the same reason only in the first case is the facial angle affected by this irregularity.

"In the first form the osseous portion of the upper maxilla is the force,

while in the rest the alveolar process and teeth. The bite varies with the cause, but is defective in every case. The gums are necessarily affected in the last. The features that these irregularities have in common are anterior protrusion and defective bite, varying in every case, but affecting the appearance of the patient in proportion to extent and duration. A diagnostic distinction of these irregularities is absolutely necessary to the determination of the methods used for correction. An upper jaw, the osseous plate of which is abnormally developed, with a normally developed alveolar process and teeth, is practically hopeless, while those forms in which the teeth and processes are abnormal are the proper field for the efforts of the practitioner. It would be useless to attempt the correction resulting from malocclusion due to the loss of posterior teeth by appliances that would be effective in the correction of the V-shaped arch, while a protrusion resulting from an excessive deposit of bone-cells requires entirely different treatment.

"Failures in the correction of irregularities are largely due to a want of recognition of etiologic differences. There is no department in dentistry that affords more interesting study to the etiologist than these cases, inviting careful observation and subject for thought in every instance."

In this work it will be impossible to review all of Dr. Talbot's articles on account of lack of space. A few of the titles of his articles and where to find them are however included: *Dental and Facial Evidences of Constitutional Defects*, *International Dental Journal*, 1896, pages 261-286. *Teeth Irregularities and the Surgical Correction*, *Dental Cosmos*, November, 1896, page 907. *Degenerate Jaws and Teeth*, *International Dental Journal*, 1897, February, March and April numbers. *Etiology of V-shaped Arch*, *Dental Cosmos*, 1897, November, page 927. *Etiology of Irregularities of Jaws and Teeth*, *Cosmos*, 1898. *Deformities of the Dental Arch*, *Journal of the American Medical Association*, Chicago, 1898. *Degeneracy—in Its Relation to Deformities of the Jaws and Irregularities of the Teeth*, *Cosmos*, 1898, September, page 734. *Unilateral Jumping the Bite*, *International Dental Journal*, 1901. *Deformities of the Jaws Among the European Degenerates*, *Dental Summary*, Toledo, 1904.

In the *Dental Cosmos* under *Teeth Irregularities and Their Surgical Correction*, 1896, page 907, Dr. Talbot wrote the following:

"Density of bone often makes it very difficult to obtain sufficient force to produce the absorption of this tissue required to bring the teeth back into place. Probably one of the most difficult operations is to carry back a cuspid, which is erupting in the vault of the mouth, back into its normal position. This not only requires considerable force, but time, to say nothing of the difficulty in attaching a cap for a point of resistance. Rotation of the teeth, especially the incisors and cuspids, is frequently difficult, if not impossible, owing to insufficient leverage.

"For seventeen years I have adopted surgical treatment, but have not made public my methods, since incidental conversation with some of the best men from time to time revealed that they had not taken kindly to it. I therefore wished to give it sufficient trial before recommending it to the profession. I have met with such markedly uniform success that I do not hesitate to recommend it to all practitioners as perfectly safe and reliable with the antiseptic

care required in surgical operations. This method consists in removing entirely the alveolar process in the line of travel of the tooth to be moved, leaving a small amount of process about the root of the tooth, holding intact the peridental membrane. This is accomplished with coarse-cut revelation burs, or those that will cut in all directions. They can thus be used as drills in certain conditions to be mentioned later on.

"If the cuspids require to be carried backward, make an appliance with

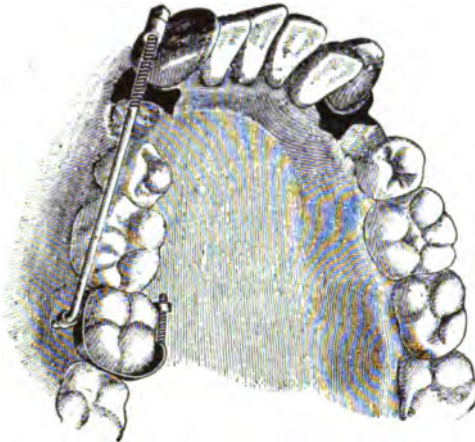


Fig. 11.—Appliance used to retract cuspid, after first cutting out a concave surface of the alveolar process.

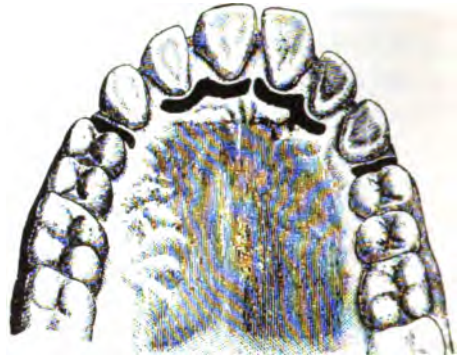


Fig. 12.—Concave surface removed from palatine surface.



Fig. 13.—Moving cuspid forward after portion of surface has been removed.

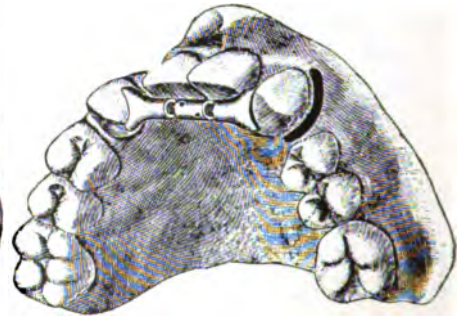


Fig. 14.—Method used by Talbot to increase space between cuspids.

bands about the first and second molars, with cap upon the cuspids and a bar with a screw and nut upon the end, as recommended by Dr. Farrar. Extract the first bicuspid, and adjust the appliance with a sharp new bur dipped in five per cent carbolic acid or one per cent corrosive sublimate or listerine. Then resting the hand against the cuspid, cut out the palatine and buccal V-shaped plate, making a concave surface of the alveolar process, as illustrated in Fig. 11. If the superior incisors are to be carried back, cut semi-circular spaces just

posterior to the teeth to be moved (Fig. 12). To carry a cuspid into place which is erupting into the vault of the mouth, remove the alveolar process in the direction of the line of travel. (Fig. 13.)

"In moving teeth laterally by a jackscrew, it will be found that not infre-



Fig. 15.—Appliance for "pulling out the central incisors," using the coiled springs in the vulcanite.



Fig. 16.—Method of retention used by Talbot.

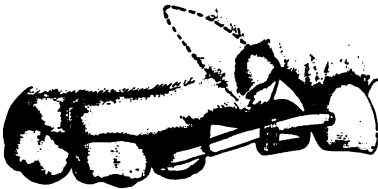


Fig. 17.—Method of causing the eruption of teeth.



Fig. 18.—To increase the space for the second premolar.



Fig. 19.—Coiled spring inserted in an eye attached to the tooth to cause the eruption of the premolar.

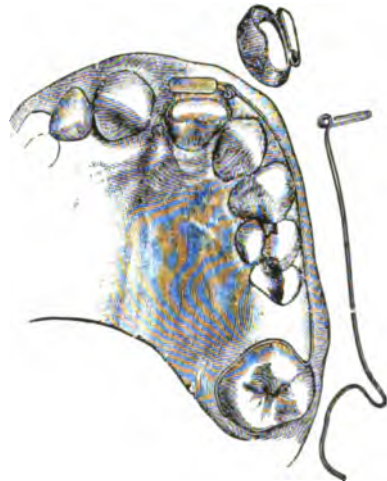


Fig. 20.—Method used to rotate a central incisor.

quently one tooth moves faster than the other. To bring both to their proper position cut out the alveolar process on the side of the slowest-moving tooth, and both will come into proper position. (Fig. 14.) To rotate a tooth, cut a

circular groove as deep as possible around the tooth, leaving enough process to hold the peridental membrane intact. In this manner teeth may be moved very rapidly and without much pain. This should always be done by means of screws. By this method we have the tooth or teeth to be moved completely under control. Any of the teeth in the mouth may be used for the fixed point of resistance, thus doing away with all unsightly appliances outside the mouth. When in place, they should be anchored in the usual manner. Antiseptic washes should be used from time to time, such as one per cent corrosive sublimate, listerine, or five per cent carbolic acid.

"In operations of this nature the peridental membrane and also the periosteum are apt to be injured. This was the particular question in recommending it to the profession. Although I have had a few cases of infection, I am quite certain now that such injuries are not of any serious consequence, since with proper precaution no bad results will follow. With this mode of treatment patients are saved time and money, and the operator worry."

Some of the other appliances devised by Talbot are shown in Figs. 15 to 20 inclusive.

# DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA

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## DERMOID CYSTS LYING WITHIN THE FLOOR OF THE MOUTH—REPORT OF TWO CASES

BY M. N. FEDERSPIEL, B.Sc., D.D.S., M.D., F.A.C.S., MILWAUKEE, WIS.  
*Professor of Oral Surgery in Marquette University*

AMONG the number of causes that bring on irregularities of the teeth and dento-facial deformities are mentioned tumors and cysts.

I have had the opportunity to operate on two cases where a dermoid cyst was lying within the floor of the mouth of each patient, the cases being similar also in size and location. Yet one had no effect upon the occlusion of the teeth while the other had a tendency to shift the lower teeth apart.

Dermoid cysts are congenital in origin, caused by the inclusion of the epiderm within the tissues formed from the mesoderm. They are usually formed in the generative organs, but may be found in various parts of the body. The lining consists of stratified epithelium containing dermoid elements such as hair, skin, teeth, nails, sebaceous matter, and more often a thick, creamy, yellowish fat.\*

Dermoid tumors, as a rule, are not noticeable at birth or in the young. They do not destroy life, and they may exist throughout life and give little or no inconvenience. Like other cysts, however, they may at any time undergo pathologic changes and become malignant, or in their growth displace adjacent structures so as to impair function.

Dermoid cysts when found in the floor of the mouth occur in one or two situations—in the midline beneath the skin or between the geniohyoglossi muscles, or laterally below the angle of the jaw.†

A very striking example of this is shown in the following case, No. I, which was reported in the *Dental Cosmos*, March, 1917:

\*Dudley: Principles and Practice of Gynecology, Philadelphia, Lea & Febiger.

†Blair: Surgery and Diseases of the Mouth and Jaws, St. Louis, C. V. Mosby Co.

CASE I

The patient, Mr. R., was twenty-four years of age and a farmer by occupation. He was referred by Dr. F. A. Tate of Rice Lake, Wisconsin. There



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.

was a large swelling beneath the tongue. The patient had noticed this swelling in this region about eight years ago. It gave him little or no inconvenience until recently, when he experienced considerable difficulty in swallowing.



*Examination.*—Within the oral cavity the swelling was so great that the patient's tongue, which was crowded into the pharynx, could not be seen. When the young man was asked to protrude his tongue the swelling would shift downward and project below the floor of the mouth close to the hyoid bone. At no time could the patient bring the tip of the tongue in contact with the anterior teeth. He talked with much difficulty and his breathing was also much interfered with.

*Mouth Examination.*—Except for a slight gingivitis there was nothing to indicate any abnormality. The mucous membrane lining of the oral cavity appeared normal. The teeth were free from caries and the occlusion was normal. On palpating the floor of the mouth I could detect a doughy feeling within the mass, which itself was moveable.



Fig 5.

*Physical Condition.*—The patient had not been gaining in weight, and during the past several months had noticed that there was a marked loss in weight due to his inability to swallow solid food.

*Past History.*—There was nothing to indicate syphilis; the Wassermann test proved negative.

The patient was admitted to Trinity Hospital and under ether anesthesia, an incision three inches long was made through the skin, extending from the chin toward the hyoid bone. The muscles were separated by first making a small vertical incision between the geniohyoid muscles and then separating them with retractors. The tongue was then grasped with tenaculum forceps and drawn forward. Pressure was brought to bear on the tongue, forcing the tumorous growth through the opening, as indicated in Fig. 1.

The mass was drawn out gently, while the operator, with the index finger, peeled away the soft tissue surrounding it (Fig. 2).



This blunt dissection revealed the fact that the mass was attached between the geniohyoglossi muscles, from which it was freed by dissection. The muscles were then brought into normal position and were held so with a buried



Fig. 6.



Fig. 7.



Fig. 8.



Fig. 9.

catgut suture, and the opening through the skin was closed with subcutaneous suture (Figs. 3 and 4).

The patient recovered rapidly and was discharged one week later.

A laboratory examination of the mass (Fig. 5) proved it to be dermoid

cyst consisting of a fibrous capsule lined with stratified epithelium, and containing a soft cheesy material.

Unfortunately I did not obtain any models of this patient's teeth to show that the normal relation of the teeth was not disturbed by the large mass.

#### CASE II

The patient, Miss C., was twenty-two years of age, colored, and a nurse by occupation.

*History.*—When patient was eight years old, she noticed a swelling under her chin. Four months later it broke open and considerable pus was evacuated. The wound healed but the growth gradually enlarged and her lower teeth slowly spread apart. During the last year the patient found it difficult to talk and swallow.

*Examination.*—The tongue was forced backwards on account of the size of the tumor. The mass would fluctuate upon palpation and by applying pressure beneath the floor of the mouth as illustrated in Fig. 6, the mass was plainly visible, filling the greater part of the oral cavity. When the mouth was closed and at rest, the tumor protruded back of the chin as seen in Fig. 7. Fig. 8 shows marked separation of the lower centrals and the teeth in end to end occlusion.

This case was referred to my clinic at Marquette University. Under ether anesthesia an incision three inches long was made through the skin extending from the chin toward the hyoid bone, the muscles were separated, the tongue was drawn forward and pressure was brought to bear on the tongue, forcing the growth through the opening (Fig. 9). For further description, see Figs. 1, 2, 3, and 4.

Patient made a rapid recovery and was discharged ten days after the operation as cured.

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## BONE GRAFTING IN GUNSHOT FRACTURES OF THE JAWS\*

BY WILLIAM BILLINGTON, M.S., F.R.C.S., CAPTAIN R.A.M.C. (T.F.), ARTHUR H. PARROTT, M.D.S., L.D.S., AND HAROLD ROUND, M.D.S., L.D.S.

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FOR rather more than two years we have had charge of the "Jaw Department" at the 1st Southern General Hospital, Birmingham (England) to which all cases of injuries to the jaws requiring special treatment are sent from the whole Southern Command. A very large percentage of these cases suffer from compound fracture of the mandible. Successful treatment involves (1) osseous union, (2) functional occlusion, and (3) avoidance of disfigurement.

In the majority of cases these results have been obtained by means of mechanical technic associated with due regard to the establishment of aseptic

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\*Reprinted from British Medical Journal, No. 3025, December 21, 1918.

conditions. In some, however, satisfactory results can not be obtained by this technic alone. Where there is a gap between the bony fragments greater than half an inch osseous union is rarely obtained unless (1) the fragments are allowed to approximate at the expense of normal alignment, or (2) a bone graft can be successfully introduced.

The gap between the fragments may be due to extensive loss of bone at the time of the injury or to subsequent necrosis from resulting sepsis. Sepsis in these cases is always severe and unless adequately combated in the early stages may be extremely persistent.

It is essential that firm osseous union should be obtained even at the expense of deformity, otherwise the power of mastication is gravely impaired. When, however, the gap is wide, the deformity resulting from allowing the fragments to approximate is so great and renders the fitting of suitable dentures so difficult that it can only be the extreme resort. A satisfactory functional and cosmetic result can then alone be obtained by successfully bridging the gap by means of a bone graft.

Other classes of cases in which surgical assistance is necessary to secure osseous union are those in which (1) there is overriding or malposition of osseous fragments; (2) mobility of the fragments from muscular action can not be prevented by mechanical means—for example, short posterior edentulous fragments.

Operation in these cases consists in carefully dissecting away the scar tissue from between and around the ends of the fragments, rectifying the deformity by the division of contracted muscular attachments and fibrous bands, and immobilizing the fragments by means of a plate and screw. If, as is often the case, a gap remains between the fragments when pared and brought into correct alignment, a small graft is introduced, and the technic is similar to that described for bone grafting.

Bone grafting in fractures of the jaw resulting from war injuries has presented many difficulties, and at first success was so rarely obtained that the attempt was given up and discouraged by very competent surgeons as not being worth while. The alternative of obtaining union by allowing the fragments to approximate led to so much disfigurement and such awkward mouths to fit with satisfactory dentures when the gap was a wide one that we felt compelled to persevere, especially because osseous union could not be obtained in a definite percentage of cases in spite of all sacrifice of normal alignment, etc. To discharge such cases with nonunion was a confession of failure that could only be made with extreme reluctance.

The technic we now employ has been reached only after much experiment, many devices having had to be abandoned. Without enumerating the various stages through which we have passed, we think that a short account of the preparation for and the performance of the operation now in use will be helpful. Whereas, success was the exception two years ago, it is now the rule, and it rarely happens that the graft fails to heal firmly.

## PRELIMINARY PREPARATION

This is prolonged, and it may be many months after the original wound was received before the operation of bone grafting can be undertaken. The fracture is always complicated by sepsis, usually severe, and often by extensive injury to surrounding soft tissues. As soon as possible an x-ray examination should be made, after which the patient should be anesthetized and the wound explored. Foreign bodies, teeth in and adjacent to the fracture, and loose fragments of bone should be removed. Larger fragments of bone with reasonably good attachments to soft tissues may be left in the hope that they will live. At the same time it is often possible to carry out some rough plastic work, the fragments of bone being replaced in as normal a position as possible and soft tissues being drawn together. Care must be taken to provide for efficient drainage and access to raw surfaces inside the mouth.

A more or less prolonged interval must now elapse while wounds are healing. Sepsis is apt to be persistent, and one or more subsequent operations may have to be performed for the removal of sequestra and drainage of pockets. During this interval careful attention must be paid to the maintenance of the patient's physical fitness by careful feeding and suitable environment. Much can also be done by means of dental splints, etc., to correct or prevent displacement of the fragments of the jaw by muscular action and contracting scar tissue, even though firm bony union can not be secured.

Finally, before attempting to bone graft, it is very important that dribbling of saliva from the mouth should be prevented by plastic operations. This dribbling is very common when there is a defect in the lower lip, and saliva soaking into the dressings greatly increases the risk of sepsis in the operation wound.

After all wounds inside and outside the mouth have healed an interval of from four to six weeks should elapse before the bone-grafting operation is performed. During this time the patient is usually sent to a convalescent hospital.

Immediately before the operation all dental fixation splints are removed from the mouth. It was found that the retention of these militated against the success of the operation. They caused risk from postanesthetic vomiting, greatly added to the discomfort of the patient, and, where pressure was exerted by them in or near the operation area, increased the risk of sepsis. For these reasons, no attempt is made to fix the fragments of the jaw during the operation or for about two weeks subsequently. Everything which interferes with prompt "healing in" of the graft must be discarded.

## OPERATION

A skilled anesthetist is essential, and we owe much to the skill with which Captain McCardie has maintained successful anesthesia under very difficult conditions.

A curved incision is made in the neck beginning one inch behind the extremity of the posterior fragment and ending one inch in front of the end of

the anterior fragment. The incision commences and finishes about half an inch above the line of the lower border of the jaw and in the neck runs about one inch below that line. It is only by carrying the incision well below the jaw and raising a flap that sufficient soft tissue to satisfactorily envelop the graft can be obtained. Often at the site of the fracture there is nothing but dense scar tissue which extends through to the mouth, and great care has to be taken in splitting this to avoid opening into the mouth, an accident which necessitates postponement of the operation. The unsatisfactory bed provided by this scar tissue constitutes one of the difficulties of bone grafting in these cases.

The incision is deepened by cutting upwards and inwards until the lower border of each fragment is reached. The soft tissues covering the outer surface of each fragment are then raised for an inch away from the gap and turned up in the flap. The ends of the fragments and the fibrous tissue occupying the gap between them are now carefully cut away. Finally, each fragment is bevelled by cutting away a flake of bone from its outer surface with bone for-

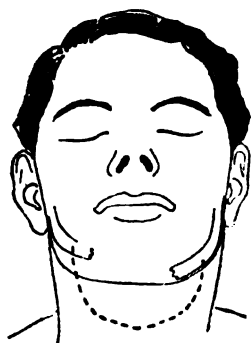


Fig. 1.

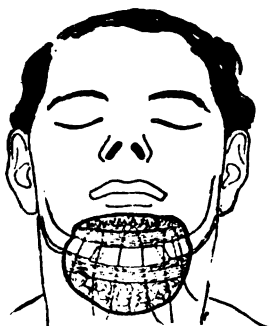


Fig. 2.

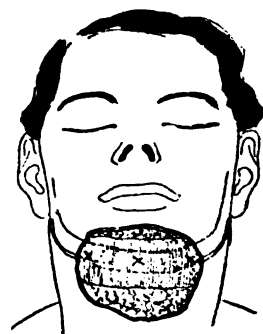


Fig. 3.

ceps. In this way raw bone is exposed at the ends of the gap and on the outer aspect of the fragments for about one inch from its extremity. All bleeding is then carefully arrested and the bone graft prepared.

After experimenting with bone from the ribs, the tibia, and from the jaw itself, the iliac crest was finally selected as the site from which to take the graft. The bone is tough and can be cut with bone forceps without splitting. Further, a graft can easily be obtained of any length or breadth and the natural slightly curved contour of the crest is approximately that of the jaw. The graft should be taken preferably from the same side as the operation wound, thus allowing the patient to lie comfortably on the opposite side.

An incision is made over the crest commencing at the anterior superior spine and extending as far back as required. The muscles are then separated on either side of the crest and pressed back by retractors. The bone is cut by an ordinary Horsley's hand saw. The graft should be two inches longer than the gap to be filled. If a more curved piece of bone is required, as to fill a gap near the chin, the graft is made to include the bone between the superior and inferior spines.

In this way a graft four inches long has been obtained which filled a gap extending from the angle of the mandible on one side to well beyond the chin on the other, and the curve was so accurate that no subsequent modeling was needed.

After removal of the bone the muscles detached from it are sewn together with catgut and the wounds closed. No inconvenience whatever seems to result.

The ends of the graft are now bevelled with bone forceps, the bevelled areas laying on the prepared outer surfaces of the jaw fragments. In this way the graft overlaps the gap at each end for an inch. Two advantages result from this: (1) A broad line of bony contact between the graft and the fragments is provided with increased prospect of speedy firm osseous union, and (2) there is practically no risk of separation in the event of the gap being increased by subsequent manipulations during the application of dental splints, as a certain amount of sliding can take place without contact being lost.

No attempt is made to fix graft or fragments by plates and screws, by wiring, or even by dovetailing the graft into the fragments. All these measures have been tried and discarded. The presence of foreign bodies greatly militates against successful healing, a sinus down to the plate or wire almost invariably forming. Attempts also to make the graft act as a splint by dovetailing it between the fragments have not led to satisfactory results.

Our practice now is to keep the graft in place by sewing the soft tissues closely over the graft and the ends of the fragments by hardened catgut. This has the additional advantage of closely surrounding the graft with living vascular tissue and abolishing dead spaces in which blood clot and serum can collect. This improves the nutrition of the graft and diminishes the risk of sepsis.

Finally, the skin is approximated with a few interrupted stitches. No drainage is employed beyond that of leaving spaces between the skin sutures to allow of the escape of serum. A simple dressing and bandage is applied and the patient sent back to bed.

No attempt is made to reintroduce dental fixation splints until the wound is firmly healed and the compound fracture has been converted into a simple one. This usually occurs in two weeks, after which the case is treated as one of simple fracture of the jaw. Firm osseous union occurs in from two to four months, but it is inadvisable to fit the final dentures until at least four months have elapsed, and it is perhaps wiser to allow an interval of six months.

We intend to supply notes of cases in a subsequent paper. We desire to record our appreciation of the very valuable assistance at the operations that we have received from Captain Learmonth and Sister Dorothy Jones of the 1st Southern General Hospital.

## GAS OXYGEN ANESTHESIA FOR MINOR ORAL SURGERY

BY JOHN W. SEYBOLD, D.D.S., M.D., DENVER, COLO.

**G**AS oxygen is undoubtedly the anesthetic of choice for the exodontist or dental oral surgeon where a general anesthetic is indicated. It is pleasant to take, quick in action, and generally free from after-effects.

It is a difficult anesthetic to administer, as it is very evanescent, especially for surgery requiring the mouth open as in tonsillectomy, tooth extraction, removal of growths within the mouth, etc. Therefore, in order to successfully administer it one must use every known scientific method available.

There are two methods of anesthetizing a patient. One is to use scientific methods, the other to literally overpower or club the patient down with the anesthetic. In the scientific administration I endeavor to approach the patient from the psychologic point of view. In order to do this it is necessary to start in at the reception room door, so to speak.

The reception room should be an outside room to avoid stuffiness, and it should be light and airy with pleasant furnishings. The girl in the outside office should be of pleasant appearance and tactful. It is her duty to see that the reception room is always neat appearing, and to select the cut flowers and see that they are kept fresh. Patients coming to such a reception room are often very favorably impressed, so much so, that even though the doctor falls short of their expectation as to personality, they will give him the benefit of the doubt. As regards furnishings and wall colorings, they should be in restful colors as it is a scientific fact that coloring has an effect on the nerves; some producing irritation, others restfulness. My idea is to get the patients into the operating room in a favorable state of mind.

The operating room I prefer to be done in gray and white. The walls gray and the wood work and furnishings white. This, of course, should be spotlessly clean, and in charge of a trained nurse. The nurse is required to be tactful as well as an efficient assistant.

The patient is then examined and his medical history taken in order to know what kind of a subject he is.

The next step is the beginning of the final effort to allay any doubt or fear that might still exist in the patient's mind in regard to the anesthetic. It is my practice to take an inhaler and stand in front of the patient and by demonstration and explanations make the taking of an anesthetic appear to be a pleasant experience.

I tell them that the anesthetic will smell like oranges (and it will for I put oil of orange in the nose mask); next that they will feel a pleasant sensation over the face, something similar to that caused by taking a drink of wine on an empty stomach; immediately following that, they will hear music as they go to sleep. This is also a fact, for as they are about to lose consciousness I turn on a phonograph.

Upon examining patients and finding them exceedingly nervous I direct the

secretary to give them an appointment for another day and I prescribe a nerve sedative which is to be taken on an empty stomach one-half hour before operating.

When the woman patient is ready for operation, she is shown to a dressing room and her corset removed. If the patient is a man he is requested to remove coat, vest, collar and necktie.

The patient is seated comfortably in the chair and the headpiece adjusted so that the head and neck is in line with the body. This promotes easy respiration. The nosepiece is held tightly over the nose and the nitrous oxide turned on slowly. After a few respirations the air valve on the nose mask is closed and the oxygen started very slowly. From here on the gas is increased to the dosage for that individual case and at the same time, the oxygen is increased according to the patient's color. Watch the respiration. It should be full and without embarrassment. If it should stop, instantly look for the cause and remedy it. It may be that the tongue has dropped back in the throat, if so get it out. Watch the color of the face and at no time allow cyanosis. Also watch out for a pasty color (putty color); it is very dangerous and the patient's color should be made to come back to a pink before resuming the operation. Do not forget that gas oxygen is a quick acting anesthetic and that a patient can be lost very quickly if the operator loses his head.

When forced to overpower a difficult case with the anesthetic, do so with the utmost caution. Look out for clonic spasms and watch the pupillary reflex. Avoid this method as much as possible. Better stop and resort to nerve-blocking anesthesia.

After obtaining a smooth anesthesia, open the mouth and wall off the operative field with a gauze surgical sponge to prevent blood, mucus and foreign substances entering the trachea.

After completing the operation, do not arouse the patient, but let him return to consciousness naturally and at the same time be on the watch to prevent an aspiration of blood, vomitus, etc.

To recapitulate, make it a point to have your office furnishings and help non-irritating.

Dismiss patients who show evidence of a painful experience by the side door.

Be sure that no blood spots or soiled linen of a previous operation is seen by the patient who is coming in for examination.

Last, but not least, teach your help and yourself that a smile and a friendly greeting go a long way with a nervous patient.



# DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Under the Editorial Supervision of

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It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

## AN UNWARRANTED ASSUMPTION OF PROFESSIONAL DUTIES

BY JULIO ENDELMAN, D.D.S., LOS ANGELES, CAL.

*Professor of Special Pathology, College of Dentistry,  
University of Southern California.*

THE advent of radiography in the practice of dentistry is responsible to a greater extent than any other measure for that improvement in the technic of dental operations and in the comprehension of pathologic processes in the dental system which has placed dentistry in the foreground of the medical and surgical specialties.

Radiography, on a par with anesthesia and aseptic surgery, has been sowing its benefactions everywhere, and the time is surely at hand when we would relinquish our professional duties rather than to be deprived of the diagnostic value of radiography in the treatment and filling of root canals. As a matter of fact, the pendulum has swung too far now in the direction of radiographic diagnosis to the detriment of those methods of clinical investigation which are being gradually neglected, if not abandoned, and without which we must insist a correct diagnosis can not be formulated in many cases, notwithstanding the availability of any number of radiographs. An optimism concerning the diagnostic efficiency of radiography born of that immutable law that bodies tend to move in the direction of least resistance is responsible to a large extent for the present unsatisfactory status of dental diagnosis. Dentists as a class are gradually losing all sense of clinical diagnosis, leaning almost exclusively upon radiography with results that are not by any means invariably satisfactory. If radiograms could be depended upon, in all instances, to portray accurately the nature of pathologic processes occurring within calcified tissues, no valid

objection could be raised against its employment even to the abandonment of other methods of diagnosis. Radiography has a place in dental diagnosis, superseded in importance by perhaps no other method, but radiography alone can not be depended upon for a correct diagnosis in all cases, any more than clinical diagnosis can be relied upon to the exclusion of radiography. The happy combination of radiography with clinical diagnosis leads to an accuracy of results which can not be attained by either of these methods separately and should be practiced jointly whenever possible. To rely upon a radiogram for a diagnosis without the assistance of the history of the case, all subjective and objective symptoms, percussion and palpation, and other recognized procedures in diagnosis, is to place the patient's physical welfare at the mercy of the inaccuracies of the x-ray machine. Not infrequently dental diagnosticians find it necessary to secure as many as six radiograms of a single area before becoming satisfied that a fairly accurate portrayal of intraosseous conditions has been secured, and even then a diagnosis is withheld until a clinical examination is carried out. But as against this, we have the commercial radiographer who, on the basis of perhaps only one picture, and with no training whatsoever in the fundamental and special subjects of dentistry, ventures out with diagnosis of questionable accuracy and dangerous possibilities. Securing a radiogram and interpreting it are two entirely different things, each requiring a different kind of knowledge, and *ipso facto* the ability to secure a radiogram does not presuppose the knowledge that is necessary in order to make a radiographic interpretation based on the anatomy of the area involved and the nature of the pathologic processes at work. We have had radiographs submitted to us with a written diagnosis (?) appended to them, prepared by men who possess no warrant, legal or moral, for venturing into fields unknown to them. And this adverse criticism is directed not alone at the radiographer who is not a dentist or a physician, but with equal force at those physicians who, unfamiliar with pathologic processes in the dental system, diagnose abscesses where none are to be found, overlook periodontal infections where it is obvious they are raging, giving patients a clean bill of health as far as the mouth is concerned, even though an extensive chronic gingivitis may be present, or order the wholesale extraction of teeth for reasons unsupported by facts. The average physician has not the necessary dental educational qualifications to justify any assumption by him of the role of dental diagnostician. As between the radiographer without medical or dental training and the physician radiographer with a smattering of dental knowledge, we would not hesitate in choosing the former. He is the less dangerous of the two.

The time has come to call a halt to a practice,—to an assumption of professional duties as dangerous as it is reprehensible, by those who evidently do not know that for the purpose of acquiring the ability to diagnose and correct pathologic processes or abnormalities in the mouth dental colleges offer courses of instructions covering a period of not less than four years to those possessed of the necessary preliminary educational requirements and moral qualifications. Dentists with a sufficient amount of training in dental pathology and allied subjects are the only ones justified in formulating diagnoses of dental conditions.

## AN UNUSUAL ANOMALY—WHAT WOULD YOU DO WITH IT?

BY JAMES DAVID MCCOY, D.D.S., LOS ANGELES, CAL.

*Professor of Orthodontia and Radiography, College of Dentistry, University of Southern California*

NOT frequently the x-ray reveals conditions so unusual that the average operator is at a loss to know what course should be followed in the way of treatment.

The condition revealed in Figs. 1 and 2 can justly be placed in this class. The history of the case is as follows:

The patient, a woman thirty-three years of age, was referred to me about four years ago by a rhinologist, who requested radiograms of the teeth and their adjacent structures.

At this time the patient had a catarrhal discharge from both sides of the nose which stubbornly refused to yield to treatment; and as there were no conditions within the nose to account for the discharge, the rhinologist suspected sinus trouble of some character. The sinuses were examined and were found to be negative. However, upon transillumination the left maxillary sinus appeared somewhat different from the right, so the rhinologist suggested radiograms as he felt that the teeth on that side might be giving some trouble. His decision no doubt was influenced by the fact the patient was wearing a bridge which extended from the lateral incisor to the first molar. The writer made extraoral radiograms of each side with the result that on the left side the condition shown in Fig. 1 was discovered.

At this time no painful reflexes were apparent and a close study of the radiogram apparently revealed the fact that the embedded tooth was not the source of any pathologic process. This being the case the rhinologist thought it best to let the tooth remain so long as it was not producing conditions detrimental to the patient's welfare.

About two years after this first radiogram was made the patient made the complaint that the left ear had begun to be "slightly noisy" or that there was a "ringing sound" in it. Since then this noise has increased and the hearing has become impaired.

Two years later I again came in contact with the patient and found that her hearing has been practically lost on the left side. Several months ago the patient had an attack of iritis, but only the left eye was affected. This attack lasted about two weeks, during which time she was under the care of an oculist. She tells me that drafts of cold air against her face cause pain within the nose, but that there is no discomfort to the outside of the face. Several days ago I made the radiogram shown in Fig. 2. I tried to make this from the same angle from which I had made the previous one and feel that I succeeded pretty well.

While the condition above the inverted cuspid does not show any radical

change, it seems to me that upon the close study of the original plates I can discern an area of lessened density above the cuspid which would indicate to me the formation of a cyst about the tooth.



Fig. 1.—Showing inverted cuspid tooth lying against the anterior wall of the antrum.



Fig. 2.—Radiogram made four years after the one shown in Fig. 1.

I am reasonably sure in my own mind that this tooth should be removed, but in order to remove it an operation of a radical nature would have to be performed.

If it were your case, what would you do with it?

# **ABSTRACT OF CURRENT LITERATURE**

**Covering Such Subjects as**

**ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY**

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

## **ORTHODONTIA**

**Artificial Feeding and Its Bearing on General Disturbances and Malocclusion of the Teeth.** M. Hellman. *The Dental Cosmos*, 1919, lxi, No. 2, p. 97.

Upon the basis of extensive etiologic studies along the line indicated in the title, the author arrives at the following conclusions: 1. Malocclusion of the teeth is neither a normal manifestation nor a normal variation, but rather a deviation from the normal to such an extent as to belong to the domain of pathology. 2. Pathologic conditions can be recognized by their diagnostic manifestations alone, and these will be of significance only as they may link the symptoms with their causes. 3. Malocclusion of the teeth has been found to occur most frequently in those individuals who were artificially fed (bottle-fed) in infancy. Of 268 patients presenting occlusal anomalies, 217 (equal to 81 per cent) were bottle-fed, or breast and bottle-fed. 4. Malocclusion of the teeth has also been found to stand in close relationship with many general disturbances caused by artificial feeding. 5. The health of the artificially fed is subject—apart from various disease processes—to political, social, and economic circumstances. 6. Of 215 cases of malocclusion examined, the fact was revealed that besides various other manifestations, symptoms were observed which are very much akin to those prevalent in rachitis, spasmophilia, and the exudative diathesis. It is therefore probable that the symptomatic factors of these disturbances found in conjunction with occlusal anomalies are but surviving manifestations of a common cause. 7. The prognosis concerning pathologic conditions, including malocclusion of the teeth, must be made from deductions based upon the evidence borne by the causative factors and diagnostic manifestations. 8. The suggestion may, therefore, be advanced that in order to promote the progress of our specialty, more definite knowledge pertaining to the etiology of malocclusion is an urgent necessity. This knowledge may be gathered from the diagnosis of our cases, provided it includes not only a record of the form of the dental arch and the position of the teeth and jaws, but also the various general dis-

turbances which the individual has passed through before presenting for treatment—for general disturbances may in many instances not only be the means of yielding a clue to the solution of many a baffling problem, but may also serve as powerful indications pointing to the origin of prevailing conditions.

**Use of Orthodontic Appliances in the Treatment of Fractures of the Mandible and Maxilla from War Casualties. Arthur Zentler. The Dental Cosmos, 1919, lxi, No. 2, p. 128.**

The great benefit that restorative oral and facial surgery for defects caused by modern trench warfare has derived from the teachings of orthodontia has placed this branch of orthopedics in the position of being as proud of its achievements as any one of the other means or methods employed for reclaiming the war-maimed for society. One need only compare the ultimate appearance of those who were not fortunate enough to obtain treatment with the aid of orthodontic appliances for war wounds resulting in jaw defects, with that of those who have had the benefit of such treatment, to realize the great need in military hospitals for men acquainted with the principles of orthodontia and the practical application of it, in collaboration with the oral and plastic surgeon.

For the purpose of demonstration the author shows 21 slides, illustrating two cases treated with the more rudimentary method of bandaging, etc., in comparison with a few treated with orthodontic appliances. In conclusion, the author states that the principles governing the treatment of all the cases, as regards the orthodontist, are those applied in the movement of teeth, stimulation of cell growth, and retention. He states they are problems with which the orthodontist is thoroughly familiar.

It remains only to call attention to the fact that while modern orthodontia practice is diminishing the diameter of the arches used for treatment, the diameter of the wire used for arches in fracture cases is of necessity much heavier. It is never less than 2 mm. and often  $2\frac{1}{2}$  mm. in diameter. It is important in usual orthodontic treatment for anchor bands to be extremely well fitted and properly cemented, it is doubly important that these two factors should be especially well observed in fracture treatment with orthodontic appliances, the parts brought into correct relation having a great and constant tendency to relapse until complete consolidation of the bone has taken place. The fact that not only methods and appliances at present in vogue in orthodontia, but even such as have been discarded by the modern orthodontist, can successfully be adapted and used in treatment of fractures is surely more than gratifying.

## **ORAL SURGERY**

**Maxillo-dento-facial Malformations.** P. Robin. *Paris Medical*, 1918, viii, No. 25, p. 492.

Irregularities of the teeth and of the jaws, altering esthetic configuration of the face as well as the shape and size of its cavities, are discussed by the author in relation to disease of the digestive and pulmonary apparatus in children. In many cases, some malformations of the jaw or teeth are found to be responsible for inadequate mastication or insufficient breathing. The correction of such maxillary or dental irregularities constitutes the first rational step in the causative treatment of gastrointestinal affections and pulmonary disturbances. The author's functional method of readjustment was successfully employed by him in his hospital, as well as private practice, favorable results being obtained without the slightest fatigue or pain on the part of the patients. The method is applicable as soon as the eruption of the milk teeth is completed, namely, about the age of three years. It does not act upon teeth, but, on the contrary, on the bones of the maxillæ themselves, which are slowly dilated by means of a small invisible apparatus worn in the interior of the mouth. This apparatus is left in place all night, and as much as possible in the day time; it is always removed for eating. The maxillary bones assume their normal form during the treatment; the teeth find their own places and become perfectly regular without having to be touched. This procedure is claimed to accomplish the correction of facial and dental deformities, excessively receding or protruding chins, etc. As a result of better breathing, the child's general development is improved, and even the intelligence is benefited, for the apparatus works not only on the bones of the jaws, but also favors the development of the cranial bones.

**Bone-grafting in Ununited Fractures of the Mandible ; with Special Reference to the Pedicled Graft.** P. P. Cole and Ch. H. Bubb. *British Medical Journal*, January 18, 1919, p. 67.

The authors employed the method of pedicled grafts in thirty-four cases; the method of free transplants is only adopted by them when a pedicled graft can not be utilized and was employed in twelve cases only. The conditions their experience has shown to be necessary to permit the performance of a pedicled graft operation are summarized as follows:

1. Site of fracture. The loss of tissue must implicate the horizontal portion of the bone; that is, the lesion must be situated at, or in front of, the angle.

2. Size of the gap. This should usually not exceed 4 cm. In favorable circumstances it is possible to cut a thick, well-nourished graft of 6 cm. in length, and a gap of 5 cm. (before trimming) may thus be dealt with, if end-to-end union is resorted to.

3. Condition of the soft parts. It is necessary that the tissues of the submaxillary triangle should be free from scar tissue on the side from which the graft is to be cut. It is extraordinary how frequently this area escapes even when the soft tissues of the face are extensively damaged.

The result is known in twenty-three of the thirty-four cases dealt with by this method; twenty-one of these, or over 90 per cent, have been completely successful. In the two remaining cases, the condition was very considerably improved and the patients themselves were thoroughly satisfied. The pedicled graft operation permits the utilization of a portion of living bone, possessed of its own blood supply, passing to it from a natural musculofascial pedicle. A lesion on one side can be dealt with by a graft taken from the opposite side; the ability to do this has been demonstrated on several occasions.

In the authors' twelve cases of free transplants—restricted to conditions not permitting the use of a pedicle graft—the result is known in ten, and of these, seven have been completely successful, giving a percentage success of seventy. Splints are removed in from three to six months. Progress is slow, and firm consolidation can not be expected in less than six months to a year.

In no case of nonunion dealt with by the authors, no matter what the nature of the operation (plating, wiring, pedicled graft or free transplant) has the patient's condition, general or local, been adversely affected by operation. "Finally, there has been no mortality and no complication of a nature to cause alarm."

**Fractures of the Ascending Ramus of the Inferior Maxilla. L. Imbert and P. Real. *La Presse Medicale*, November 25, 1918, p. 601.**

Fractures of the ascending ramus of the lower jaw were very imperfectly known prior to the war. In these cases, it is always difficult or even impossible to demonstrate the ordinary pathognomonic signs of fracture, in the form of bony crepitation and abnormal mobility. However, although the symptoms may at first sight appear obscure, these patients present as a rule very characteristic, in fact pathognomonic, changes in the articulation of the teeth. Only those fractures are here considered which are associated with a displacement of the fragments, due to muscular action and always occurring in a given direction. The principal fragment, consisting of the larger portion of the mandibular arch becomes considerably displaced, being drawn upwards and slightly backwards through the action of the internal pterygoid and masseter muscles. The small fragment, comprising the coronoid process, the condyle, and a more or less considerable portion of the ascending ramus, moves upwards and forwards under the action of the temporal muscle. In a case of fracture without loss of substance, the fragments override each other; in the presence of a more or less marked bony gap, on the contrary, a depression is produced at the level of the fracture focus. The result of these displacements is always a shortening of the ascending ramus of the jaw. This modification in the length of the fractured bony lever governs the disturbance of the interdental relations in the closing of the jaws, and separation of the jaws in opening the mouth, and in performing the different movements of the mandible. The prognosis of fractures of the ascending branch with displacement is on the whole rather favorable, provided they are properly treated. Consolidation is the rule, even in the presence of fairly extensive destructive lesions. The treatment of these fractures consists of reduc-



tion followed by immobilization of the fragments. Whereas the reduction of the principal fragment is easy enough, the small fragment, on the contrary, is often more or less inaccessible, especially when the fracture is situated high up, and considerable difficulties may be encountered in attempts at reduction and immobilization. The reduction of the small fragment is fortunately not indispensable, experience having shown that it does not undergo any notable deviation when immobilization of the jaws in occlusion is accomplished at an early date.

**Resilient Teeth: A New Development in the Making of Artificial Dentures.** Morse Withcombe, Australia. *British Dental Journal*, 1919, xl, No. 2, p. 48.

This device consists of a solid porcelain tooth which is so fitted and retained in a metal socket that it has a limited range of movement in every direction. At the base of the porcelain tooth is baked a layer of metal filings to which the soft rubber, when vulcanized into the socket under pressure, adheres most tenaciously, thereby preventing any possible ingress of secretions between the porcelain tooth and the rubber in the socket. Furthermore, the springy movement of the rubber during mastication makes it impossible for secretions to remain about the margin of the collar. It is claimed that this artificial periodontal membrane permits of some amount of individual tooth movement and that it acts as a shock absorber and prevents the teeth clacking together. A Sydney bacteriologist examined some of these teeth which had been worn in the mouth. He reported that he received direct from the mouth a plate containing three teeth. The plate was washed in sterile normal saline, and the teeth were very carefully broken out of their beds, which were composed of good red rubber. There was not the slightest odor to be detected. Agar slopes were inoculated from the material left in the cavity from which the teeth had been broken and from the surface of the rubber bed. After forty-eight hours all cultures remained sterile.

**Anesthesia for Dental Operations.** R. W. Hornabrook, *The Medical Journal of Australia*, 1918, ii, No. 3, p. 63.

The following is a return of the general anesthetics administered at the Melbourne Dental Hospital from July 1, 1906, to June 30, 1918, viz., a period of twelve years. All the administrations have been given in the upright position, the patient sitting in the dental chair. There has not been one fatality, and it is extremely rare to have any sign of collapse. Of the total number of 32,236 administrations, 30,433 were cases in which ethyl chloride or somnoform was used alone, or in conjunction with other anesthetics. The present method is to use 2 c.c. of ethyl chloride in conjunction with 5 c.c. of somnoform in the majority of cases. The anesthesia is what may be called a "push anesthesia," in that the air valve, which is circular, and not less than 1.25 cm. in diameter, is gradually closed over and not completely closed until the patient is just about fully under, viz., from three-quarters to one minute from the commencement

of the administration. Nitrous oxide has been practically abandoned as an anesthetic in this hospital since the end of 1915; in fact, in only 145 cases has nitrous oxide been used since June 30, 1912, the semi-open ethyl chloride or somnoform administration having been found to be more convenient in every way and equally safe.

Complete record of twelve years' anesthetics:

Nitrous oxide,	1,654
Nitrous oxide and ethyl chloride,	3,778
Ethyl chloride,	11,969
Somnoform,	13,859
Ethyl chloride, chloroform and ether,	51
Ethyl chloride and ether,	91
Ethyl chloride and somnoform,	485
Ethyl chloride and oxygen,	197
Nitrous oxide and oxygen,	138
Chloroform,	11
Nitrous oxide and somnoform,	3

In the 13,859 somnoform cases, a number of those in which 2 c.c. of ethyl chloride was given with the 5 c.c. somnoform is included.

**Salivary Tumor of the Parotid Gland.** H. Kuttner. *Deutsche medizinische Wochenschrift*, 1918, No. 11. *Correspondenzblatt für Schweizer Aerzte*, 1918, No. 45, p. 1512.

The author discusses a rare condition of painless intermittent salivary tumors of the parotid gland, in the absence of a demonstrable obstacle. The symptom of intermittent salivary tumor is usually considered as typical of salivary calculus. Very painful acute swellings of a salivary gland make their appearance in the form of salivary colics, usually during meals. The phenomena gradually subside again, after a profuse evacuation of saliva, sometimes also of pus. More early, similar phenomena are observed in inflammation of the main excretory ducts, especially the parotid duct; there may be paroxysmal swellings and pains, caused by obstruction of the duct with a fibrinous plug. In certain cases, the inflammation takes a chronic course and the duct remains permanently thickened.

In two cases of well-marked salivary tumor, under the author's observation, no obstacle could be demonstrated and all inflammatory symptoms were absent. The retention of saliva induced a considerable swelling of the parotid gland, occurring during meals and associated with a sensation of slight tension. After a few days, the phenomena subsided, without any therapeutic measures in one of the cases. In the other case, the salivary duct was cautiously catheterized, without encountering an obstacle, the catheterization was followed rather by an increase in the disturbances. Both these patients were women with a delicate skin, and the trouble appeared in the cold season of the year. The author is inclined to refer the anatomic bases of this salivary retention to a plug formed by the secretions, or to a swelling of the buccal mucosa.

Salivary calculi are not likely to cause diagnostic difficulties unless the stone

is situated within the gland—almost invariably the submaxillary gland—or in the first part of the excretory duct. The difficulties increase when well-marked inflammatory phenomena make their appearance in the surroundings of the gland. Catheterization and radiography are reliable adjuvants in these cases.

**An Experimental Study of the Influence of Diet on Teeth Formation.** M. Mellanby. (From the Household and Social Science Department of the London University, Kensington.) *The Lancet*, London, December 7, 1918, p. 767.

In this preliminary report to the Medical Research Committee the author describes her experimental finding in puppies, concerning the factors involved in the development of sound teeth and of the growth of the jaws in relation to the size of the teeth. Evidence is adduced to show that : (1) hypoplasia of the teeth is caused largely by a deficient diet; (2) the factor in the diet which controls the calcification of the teeth is something of the nature of an accessory food factor (vitamine); and (3) is largely responsible for the calcification of bone, a deficiency of this substance in the diet being followed by the development of rickets. The teeth may become so soft that they can be cut with a scalpel.

The diets of the dogs, on which they were put when approximately eight weeks old, consisted chiefly of white bread and separated milk, about 200 c.c. daily, together with the fat substances to be tested; namely, codliver oil, butter, and linseed oil, which were added in daily quantities of 10 gm. respectively, in three groups of animals. The experiments showed that when linseed oil is the only fat in the diet, there is a delay in the shedding of the deciduous teeth and in the development of the permanent dentition. The animal fats, more particularly codliver oil, cause these changes to proceed in a normal way. The arrangement of the teeth and their appearance is much better when animal fats have been eaten. In the experiments so far completed, the teeth most commonly affected are the lower carnassials. There is some evidence to show that if the diet is only started when the puppy is over three months old, then the development of the teeth is little if at all affected.

In summarizing the results, the author emphasizes that this is an instance of diet affecting the teeth from the inside and is independent of bacterial sepsis and other oral conditions associated with food. "There is no doubt that our modern dietary is harmful so far as the teeth are concerned." Specially prepared cereals, which constitute a considerable part of the modern diet, especially in the poorer classes, in the form of wheat, rice, oats, etc., as well as bread and potatoes, are deficient in the type of accessory food factor found in whole milk and the animal fats, which favors the development of sound teeth.

**Adenoids, Decayed Teeth and Irregular Arches.** C. N. Peacock. *British Dental Journal*, 1918, xxxix, No. 23, p. 689.

A flat plate of vulcanite or metal, made by the author, is recommended for the prevention of mouth-breathing in sleep. This type of plate has been used in the treatment of pyorrhea for some time past. The plate slips in between the

lips and the teeth, extending as far back as the first molars, and is as wide as the child can conveniently bear so as to prevent mouth-breathing. It should be worn regularly for the first four months, three times a week for the second four months, down to one night a week, according to age and condition of teeth.

### ***RADIOGRAPHY, Etc.***

**Radiotherapeutic Dosimetry.** H. Guilleminot. *Archives d'Electricite Medicae et de Physiotheraque*, 1918, xxvi, p. 395.

The necessity of accurate knowledge of dosage in radiology is emphasized by the author, who contributes two methods devised by him for the measurement of x-ray doses. The first is a fluorometer, in which the fluorescence of a barium platino-cyanide screen produced by the incident x-rays is standardized against a quantity of radium affixed to the apparatus in the vicinity of the screen. This method is very accurate, but also very expensive on account of the high cost of the radium standard itself. The second method is a fluorometer with a luminous standard, the light from a standard electric bulb being cut down by appropriate colored screens until it affords a degree of luminosity and a tint which are comparable with the luminosity of a fluorescent screen contained in an adjacent part of the apparatus when acted upon by the x-rays which it is desired to standardize.

The effective dose of x-rays at various depths in the tissues depends largely on the varying degrees of hardness of the rays. The behavior of the body tissues towards the x-rays was determined in the author's experiments by means of hydrated gelatine of density 1.05, which is approximately equivalent to the specific gravity of the tissues. The effect depends on the amount of radiating energy fixed by the cell plasma. From the therapeutic viewpoint, it appears advantageous according to the author to utilize in case of superficial lesions of the integument, a radiation No. 7 with filtration of about 1 millimeter. In case of deep lesions, more filtration is required, increasing in proportion to the depth of the lesions. Several entrance avenues for the rays should be employed in order to augment the efficiency of the dosage.

**Radium Treatment for Epithelioma of the Lower Lip.** G Elliott. *International Journal of Surgery*, 1918, xxxi, 394.

Elliott recommends radium therapy for epithelioma of the lower lip. He claims the cosmetic result is very satisfactory. Very often there is no scarring. It is a pleasant treatment to the patient, some even claiming that they never feel any pain at all during the healing process. Yet others quite often complain of considerable pain.

Elliott claims that radium does not act in the same manner in all individuals. In some reaction has set in within eight days and with the same applicator as late as fourteen days.

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## EDITORIALS

### Students' Army Training Corps—A Success or a Failure?

ON or about December 21, practically all of the students who were members of the S. A. T. C. were demobilized; thus passed into history one of the greatest and most unique undertakings which was the outgrowth of the war. Whether the men in the S. A. T. C., especially medical and dental students, should have been educated to perform their particular service or whether they should have been given a certain amount of military training is still a question. We find some educators in literary schools raising the question as to whether the S. A. T. C. was a success even among such schools and departments.

When the draft age was extended to include practically all college students, it became necessary to do something to protect the schools and the universities, or they would have found themselves without students. Army men also recog-

nized the necessity and value of college trained students, not only as soldiers, but also as candidates for officers' training camps, and consequently the S. A. T. C. was the result of efforts made to protect the universities and colleges and to provide them with students, and still make the students subject to draft and military training. We realize that the plan was not carried out long enough to establish a proper cooperation between the military and educational authorities.

In the first place, it became necessary for the college curriculum to be arranged so as to provide certain hours for military training, and if those particular hours had been adhered to closely, some of the conflicts which arose, would not have occurred. By that we mean, for example, say two hours of military training was required each day, the college curriculum was arranged to provide for those four hours and then it was presumably supposed by the educators that the remainder of the time would be allotted to collegiate work and be free from military training. While technically probably four hours (or whatever the average time was) for military training might be all the students were given credit for, however, if anything extra developed along military lines, the extra time was taken out of the collegiate work and collegiate time and not out of military time. For example, if it became necessary for a student to have a medical examination, or have insurance papers filled out, and any other clerical tasks performed, receive his pay or anything else, which had a strict bearing upon military life, that time was not taken out of the time allotted to military training, but was taken out of the collegiate work. Consequently as a result of this, classroom work and laboratory work was extremely irregular and along with military, kitchen, and fire police duties, students were always provided with satisfactory excuses when late to a class, and it was an excuse over which the collegiate instructor had no power. So far as we know there were no open breaks between military and civilian collegiate authorities, because the collegiate authorities realized the military power was supreme, and consequently adapted themselves to the condition, even if those conditions were the result of an overenthusiastic second lieutenant who had just returned from an army training camp.

As it developed, if at any time during the day the commander of the S. A. T. C. camp decided that he wanted a particular lot of men, regardless of what class they were in, lecture or laboratory, the whistle was blown and the whole lot called out of class to receive the military instructions. We admit that in some cases it may have been a military necessity, but in most cases it was done without the military authorities realizing the responsibility or the impracticability of calling the students from the midst of the class to perform some task or to receive some instruction which they could or should have received during the hours set aside for military training.

Owing to the fact that students were under military discipline it was very difficult to keep attention in the classroom because a great many students took the attitude that the military authority was the only one that could control them, and so far as the collegiate authority was concerned, the students could do practically as they pleased, for the universities and schools were at the mercy of the military authorities. Possibly such things as we have mentioned would have been adjusted had the S. A. T. C. existed a longer time, but up to the present time it was very destructive to regular classwork and made it practically im-

possible to follow a certain schedule or perform a certain amount of teaching in an allotted time. Some educators had become so discouraged that they were talking of resigning, and, had the S. A. T. C. continued longer, there would have been many vacancies on teaching staffs.

We believe it would have been better to have taken certain students and given them strict military training under military men, and other groups, medical and dental, should have been given strictly professional work for the amount of military training the medical and dental students received only interfered with their professional training to such an extent as to make them deficient compared to other years, and still did not give them any great amount of military efficiency.

In August and September when it became known that every student who entered college would become a member of the S. A. T. C., be allowed to take certain lines of college work, be given his uniform, mess, and thirty dollars a month, a large number of students entered college simply because of the seemingly great advantages held out to them. Consequently, a large number of students began college work who had no intention of ever finishing when they began, and simply took that method as a means of avoiding an immediate service in the army; and as things have developed, succeeded into getting out of actual service by entering the S. A. T. C. This class of students demoralized college work more or less, and, consequently, they have been one of the most disturbing factors in keeping class discipline encountered. Consequently with the disbanding of the S. A. T. C. we find a large number of students who will discontinue college work, and go back into commercial life without having benefited themselves to any great extent, and without benefiting the school or university.

One of the things which developed from the S. A. T. C. was the compulsory hours of study which at first glance seemed to be an advantage, but which from a practical standpoint failed to accomplish any great results. It is true that the students were required to assemble in certain halls for definite hours of supervised study, but the actual result accomplished during those supervised hours from information obtained from observation and conversation with the student, and from the knowledge of the men who supervised the studies, very little was really accomplished. First, it was rather impractical to have a large number of students studying together in one room, because it is almost impossible to avoid some sort of disturbance. Second, owing to the crowded curriculum which was necessarily found in the schools, as a result of military training, the supervised hours of study came after everything else was done, and most of the students were in no physical or mental condition to apply themselves during these supervised hours.

Taking the thing as a whole, during the length of time the S. A. T. C. was in existence, we believe it would have been better to have had military training and professional instruction separate. We believe better results could have been obtained in both cases.

### The Prostitution of Radiography

**A** FEW years ago when radiography was given to the medical and dental professions as an aid in the diagnosis of obscure conditions, a great many of the more progressive men hailed it as one of the greatest adjuncts that had been given the professions. A number of men in both professions immediately took up radiography to aid them in their work, and also began making pictures for others of the profession.

As the success of radiography depends a great deal upon the equipment employed, commercial concerns very wisely began improving their output of machines and tubes. This improvement from the manufacturer's standpoint opened a field for young men as commercial salesmen, who consequently learned the radiographic technic from a purely business standpoint in order to enable them to make satisfactory pictures for demonstration purposes when attempting to sell a machine or when demonstrating before medical and dental conventions.

With this knowledge of radiographic technic, and with practically no knowledge of anatomy and physiology, only such as they were able to absorb from conversation with medical men, some of these men established "X-Ray Laboratories" in various cities for the purpose of making pictures for the profession as well as the public. From the purely commercial standpoint these progressive individuals should not be criticized, because they realized they could make more money than by confining themselves to selling x-ray apparatus. However, the difficulty arose from the fact that there was gradually creeping into the practice of radiography a number of men who had no idea of professional ethics and who were absolutely ignorant in regard to asepsis, anatomy, and physiology. Many of these laboratories began making pictures on a strictly commercial basis, for so much a picture, rather than making them in relation to the value of the picture in the treatment of the conditions presented. In other words, it makes no difference to the laboratory how obscure the condition may be, or how evident or simple the difficulty, each picture is made absolutely alike, for the same price, and is given the same technic. Under ordinary conditions satisfactory pictures often are made; however, in the majority of cases when obscure conditions arise, where the picture can be only satisfactorily made or interpreted with a knowledge of the clinical conditions of the case, by some one who has an intimate understanding of pathology and anatomy, the pictures are practically useless.

In some instances pictures are made in x-ray laboratories upon the solicitation of the public, while other laboratories realize the advantage of advertising that they make pictures only for the profession. Regardless of the plan followed, it still leaves the objection that the patient is referred to an x-ray laboratory that is conducted by an individual who has no idea of professional ethics, no idea of hygiene or antisepsis, consequently a patient is very likely to become infected from the fingers of the operator, because he (the operator) realizes the more rapidly he can take his picture, the more money he can make, therefore antisepsis is discarded. Such a thing as washing the hands when passing from



one patient to another or sterilizing the equipment that comes in contact with different patients is unheard of in the majority of the x-ray laboratories. Just exactly how many pathologic conditions have been spread through commercial x-ray laboratories it will be impossible to state because there is no means of checking this up.

We find a large number of the profession who have unwisely supported these commercial laboratories because of the small charge they make, the laboratories being able to make this small charge because they are run on a basis of volume instead of diagnostic and scientific value. Very often we receive in our office announcements of x-ray laboratories having long, high-sounding names, but failing to give the name of the proprietor or men who are responsible for the work. In other words, the members of the profession are invited to send their patients to a laboratory without knowing the standing or ability of the man who is to make the radiogram.

Most of these men conducting x-ray laboratories have only the knowledge gained by some experience with electricity and photography, and their knowledge of anatomy and pathology is nil, or at least so meager that they can not be recognized as dental or medical men. Some of them have been x-ray salesmen, while others have been window trimmers and have graduated from that trade into that of making a diagnosis for professional bodies within the space of twenty-four hours. In one announcement which we have on our desk we read the statement "at the end of each month we will mail you a check of twenty-five per cent of all the business you send us." We do not know who the owner is, for no one is mentioned as the proprietor of the laboratory, consequently, such a thing as personal responsibility is not considered because no reliable ownership is mentioned.

Many states have laws which make it necessary for those practicing dentistry or conducting "dental parlors" or advertising offices to use their own names, but regardless of this, x-ray laboratories are allowed to exist and solicit business from the profession and not use any individual name. Much has been written on the ethics of paying commissions, still x-ray laboratories openly advertise such facts. Even though we disapprove of the paying of the commission, we must confess respect for the laboratory that is bold enough to advertise its plan, and not do as some dental and medical men do, namely, condemn the practice openly and be a party to it privately.

The dental profession has been forced to submit to dental laboratories for a number of years practically for the same reason that they are contending with commercial x-ray laboratories. It is true that a number of men working in the dental laboratories are making a certain style crown quicker, better, and cheaper than the average dentist, but they can not make a crown better than a good dentist. It is equally true that a good many of the x-ray laboratories make a cheaper radiogram better and quicker than an amateur radiographer, but they can not make a scientific radiogram better than an experienced radiographer who not only possesses radiographic technic, but a knowledge of anatomy and pathology as well.

Another factor which is undesirable is that men who conduct these x-ray

laboratories are inclined to place themselves on a level with the profession, many of them assuming the title of "Doctor," and are being so addressed by their patrons. Dental societies have unconsciously promulgated this idea by inviting commercial radiographers to read papers before their meetings. At the present time the Educational Council of the National Dental Association, The Faculty Association, and the state boards, in fact practically every reputable dental body, is trying to raise the standard of dental education by increasing the length of the term and by raising the entrance requirements. Still many of the members of the profession are unknowingly lowering those standards by sending their work to commercial laboratories, and some dental societies are doing the same thing by inviting commercial radiographers to read papers.

The prostitution of radiography by commercial laboratories is a fact, and the condition existing at the present time can be successfully combated only by men realizing that radiography is a profession and should be followed by professional men and supported by professional men, and not commercialized.

It is useless to try to raise the standards of the profession in one place and let them down in another.

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### Orthodontic Appliances for the Gullible

**T**HERE is no other branch of dentistry in which the members are more easily deceived than in orthodontia.

It has been said by a great advertising expert that a fifty cent article can easily be sold the public at a five dollar valuation if it is backed by a proper, systematic advertising campaign, keeping the article constantly before the prospective customer. This adage equally applies to worthless orthodontic appliances. They can be sold in large quantities to the dental profession if given persistent, vigorous advertising claiming them to be the eighth wonder of the world and capable of working while you sleep.

Orthodontic appliances whose basic principles are ludicrous; appliances which no man would ever have the courage to demonstrate in a clinic before a society of orthodontists; appliances so crude in mechanical construction that they resemble a barbed-wire trench entanglement in the mouth—the sum total of all of which means appliances that are absolutely rubbish—are sold the members of the dental profession because they are told to buy such antiquated, unscientific apparatus by manufacturing concerns who know the power of advertising. This is not a case of "blind leaders of the blind," but a case of wide awake leaders of the blind.

Shades of the past! How long is the dental profession to remain in peaceful ignorance as to modern orthodontic technic? Such ignorance not only renders possible the sale of detrimental so-called "orthodontic" appliances, but it compels children to have their teeth tampered with for several years with inefficient, harmful brass.

Education and information are what is needed. Orthodontists should read papers before dental societies. The dentist should be just as well informed

on the progress being made in orthodontic technic and appliances as he is on other recent developments, such as the filling of root canals, radiography, oral prophylaxis, focal infection, conductive anesthesia, oral surgery, etc., and it is the duty of the orthodontist to give him this information.

Orthodontists are prone to read advertisements calling attention to these "wonder appliances," laugh, and turn over another page; but it is to be remembered that while indifference to such appliances does the individual no harm, even the sight of such methods of treatment does his profession a great injury.

This is considerable space to devote to an "overnight" orthodontic machine; however, this all reminds us of the Robert Burns classic: "Oh wad some power the giftie gie us, to see oursel's as ithers see us!" Then, too, it demonstrates that you can lead a horse to water and you *can also* make him drink.

### **The Forsyth Dental Infirmary for Children**

The Post Graduate School of Orthodontia of the Forsyth Dental Infirmary for Children is to resume its activities which have been suspended during the war. The next session will begin October 6, 1919, with an Advanced Course of thirty-two weeks. Harold DeW. Cross, D.M.D., Director, 140 The Fenway, Boston, Mass.

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### **American Institute of Dental Teachers**

The annual meeting of the American Institute of Dental Teachers was held at the Piedmont Hotel, Atlanta, Georgia, January 28-30th, 1919. The following officers were elected for the ensuing year: President, Dr. R. W. Bunting, Ann Arbor, Mich.; Vice-President, Dr. Arthur D. Black, Chicago, Ill.; Secretary-Treasurer, Dr. Abram Hoffman, Buffalo, N. Y. Executive Board, Dr. G. S. Millberry, San Francisco; Dr. A. H. Hipple, Omaha; Dr. A. E. Webster, Toronto. The next regular meeting will be held at Detroit, Mich. By order of Abram Hoffman, Secretary, 381 Linwood Avenue, Buffalo, N. Y.

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## ORIGINAL ARTICLES

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### PRESIDENT'S ADDRESS BEFORE THE AMERICAN SOCIETY OF ORTHODONTISTS\*

BY OLIVER WILSON WHITE, D.D.S., D.D.Sc., DETROIT, MICH.

IT is my privilege to address you, as president, at this the Nineteenth Annual Meeting of the American Society of Orthodontists.

To our guests and friends, I extend a most hearty welcome from the Society.

It would seem but fitting at this meeting in St. Louis that I should adhere to the proverbial custom of presidents of scientific and arts societies, of reviewing the past achievements and I might say (mis-chievements) of our academy. However, as we are to enjoy a paper by Dr. Weinberg covering the period of the existence of this Society, giving index and classification of work, in order that there will be no duplication, I am going to make a comparison of the president's address on the morning of the first meeting and conditions existing on the opening of the present meeting.

To many of us this particular meeting in St. Louis is of great interest and pleasure, because it is the city in which most of the older members of this society secured their inspiration and knowledge on which they built their orthodontic practices.

I can not refrain from paying tribute at the outset of my remarks to Dr. Edward H. Angle. To Dr. Angle is due the credit of not only the organization of this society, but the teaching of the first men who entered the specialty of orthodontia. We who were privileged to attend the Angle School of Orthodontia in this city, can well recall the sacrifice of time and energy that Dr. Angle gave the promotion of orthodontia, and it is a great personal regret, which I am sure you all feel, that we can not have Dr. Angle with us at this meeting, that we

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\*Delivered before the Nineteenth Annual Meeting of the American Society of Orthodontists, St. Louis, Missouri, March 10, 1919.

might show our appreciation and gratitude for what he has done for this society and its members.

Dr. Angle's views of the future of orthodontia were expressed in his address at the first meeting of this society in 1901 and show the clear conception he entertained of the future need of developing orthodontia as a specialty, and I would like to quote from that address a few paragraphs that can not fail to interest you.

In opening the meeting he said, "This morning marks another epoch in the history of science, the opening of the first meeting of the Society of Orthodontists, a society organized for the promotion and exaltation of that branch of dental science known as orthodontia, and looking to the early and complete recognition of this branch as a distinct specialty, to be taught and practiced as such.

"Doubtless it would not be inappropriate for me at this time to set forth the reasons for the organization of such a society, for unless there be good and valid reasons for its establishment, its course must be marked by an unhealthy and unprofitable existence, and probably an early dissolution. On the other hand if there be good and sufficient reasons for such a society they should be known and recognized by the lovers of all branches of medical science, and the sympathy and assistance of all enlisted, that the greatest degree of benefit may be conferred, not only to the science of orthodontia, but to humanity at large, to whose welfare all laws enacted, and all societies organized owe their first duties. Hence I shall endeavor to set forth some reasons why this organization should be founded, and why I believe this meeting marks the beginning of something so grand, so noble, something destined to so elevate dentistry in general and so greatly benefit humanity that even we who are assembled here this morning do not yet dream of its full importance, though we, as founders, are most interested, and our hearts beat highest in enthusiasm, anxiety, and love for this branch of science, and the success of this, the first meeting."

To prove that Dr. Angle's predictions of the success of orthodontia, as a specialty, I wish to call your attention to the wonderful progress and growth during the existence of this society. Three years after organization there were only seven orthodontists in the country; today there are several hundred practicing this specialty, and its field of usefulness has attracted very broad attention. A progress I am sure reflects great credit on the judgment of the organizers.

Not only have the orthodontists increased rapidly in number, but we have several orthodontic societies, that are doing very valuable work in furthering the cause of orthodontia. That orthodontia has elevated dentistry is reflected by the inspiration given by members of this specialty to the formation of different specialties in dentistry. I refer to the periodontologist, exodontist, prosthodontist and radiodontist.

Dr. Angle spoke of the history of orthodontia up to that time following with a paragraph on the lack of knowledge of this subject, from which I quote the following:

"While the demand for general operations in dentistry is supplied with as high an average of skill, perhaps, as any of the branches of the arts or sciences, the same can not be said of orthodontia, for notwithstanding the fact that mal-

occlusion with all its baneful effects has grown to be almost the rule, instead of the exception, only the merest fraction of those needing attention are receiving it, and even such treatment as is meted out is of such a nature as to leave but little doubt in the mind of the careful investigator that more blunders are committed than successes gained, and that in a heavy percentage of cases more injury has been done to the dental apparatus as a whole than benefit conferred, to say nothing of the frequently severe tax unnecessarily inflicted upon the entire physical economy of the patient."

Regarding the above paragraph the only comment I would like to make is that today the conscientious dentist does not attempt the correction of cases unless specially qualified to do so, and treatment of orthodontic cases is rarely attempted in connection with the successful practice of general dentistry.

Regarding appliances Dr. Angle had this to say: "Some of them, marvels of ingenuity and skill, others absurdly complex, most unsightly, crude, and inconvenient in the extreme, as inefficient and faulty in principle as it is possible to imagine and made to operate in direct violation to many of the true physiologic requirements of tooth movement and hygienic conditions incident thereto. They are produced in ignorance and operated in ignorance and the results are familiar to all, yet our current literature still teems with them."

In no other channel has orthodontia developed to the extent it has in producing efficient, esthetic, and prophylactic appliances for orthodontic treatment. It is impossible for me to trace the wonderful progress our profession has made along this line, as time will not permit of my recording this history.

Unfortunately we still have with us the commercial orthodontist, if such a term is proper, who advertises his wares and knowledge for sale to the dental profession. However, they are very few in number, and the members of the profession, as they become enlightened, realize that orthodontia will never be included in the curriculum of a correspondence school.

In contrast the attitude of the dental profession towards orthodontia in 1901 and 1919 is very much marked and it might be of interest to review the questions Dr. Angle asked the morning of our first meeting:

"Why is it that so little really good work is done in orthodontia, in proportion to opportunities and importance?" This may be true to a certain extent today when we consider the proportion and opportunities offered, but the exceptional high-grade work accomplished in all of our large cities today by members of this specialty is very gratifying and time will soon grant the privilege to everyone, the opportunity of having proper orthodontic treatment when required.

"Why is orthodontia in practice but a side issue to all other operations in dentistry?" This is not the condition today, and to the founders of this society is due the credit of changing this condition. The dental profession has, through the teaching and clinical work of the orthodontists, come to recognize the value of occlusion as the foundation of all dental operations, and look upon orthodontists as guardians of occlusion.

"Why are the discussions of papers on orthodontia so lamentably weak, usually confined to the discussion of peculiar regulating appliances, or tedious description of so-called rare cases?"

Today the reference to orthodontic appliances is very rarely made at a

dental meeting, but on the contrary very intelligent discussions on occlusion and the value of early orthodontic treatment, for the establishment and preservation of occlusion, is often in dental literature. This condition is brought about by improved orthodontic instruction in postgraduate schools and colleges.

The advice given parents regarding correction of malocclusion by general practitioners of dentistry is very different today from what Dr. Angle stated that morning. It is very gratifying to note in recent years the growing percentage of young patients seeking advice and treatment for malocclusion in its early stages of development. In fact, preventive measures in all branches of the dental and medical science have progressed so rapidly that consultation for early diagnosis is proper and common practice today.

Our president in 1901 said the answer to all these questions seemed plain to him, and should, as we think, be apparent to all, even to casual investigators. It is that orthodontia is a great science by itself with requirements in its study and practice so radically unlike that of other branches of dentistry, that the two can never be profitably combined either in study or practice. Each seriously handicaps the others, and orthodontia naturally suffers most, for the reason that it is wholly unlike other operations in dentistry. It is therefore least understood, least studied, and made secondary alike in dental colleges, in practice, and in dental societies. Hence it is not unlikely to follow that in proportion as a dentist is successful in other operations of dentistry, he will naturally be less successful in those of orthodontia, for in that same proportion he will have less inclination, less time, and less energy to devote to it. Under heading of orthodontia as a separate science he spoke as follows: "Orthodontia has been revolutionized and we would ask those who may doubt the practicability of this specialization of orthodontia, to but reflect on the marvelous advancement which has been made in the various branches of medicine through specialization, not to mention the growth of nearly every other branch of science and art accomplished by the same power. Indeed, this is the very age of specialization, and was there ever such an age of progress? Wise is he who recognizes the natural and resistless power of specialization, and narrow indeed must be he who is blind to its demands and attempts to resist its might."

So we must work patiently, and wait, and believe that orthodontia, so replete with possibilities for improving the health and the happiness of orally deformed humanity, and for uplifting the highest phase of art, or that of improving the lines of beauty, and that, too, not applied to the cold unresponsive lines of marble, clay, or on canvas, but to the living, divinely patterned human face, will and must be a firmly established and useful specialty of dental science; and if this is inevitable, as I believe it is, then it is fitting and proper that this society should be maintained, for our best efforts can only yield the best fruit in strong, earnest, sincere, concerted action.

As we look back today and take into consideration the different impulses of progress in orthodontia, we realize that this success could never have been attained had not orthodontia been divorced from the general practice of dentistry. The men who made this progress possible were not cranks, as a president of the National Dental Association stated, but were men of high ideals, concentrating their efforts to correct malocclusion, one of the chief factors in the destruction

of the human mouth, and the great value of orthodontic treatment today is being more and more appreciated, showing that a great many of the hopes and predictions are fulfilled that were entertained by those pioneers who left the meeting, thrilled with ambition, to place orthodontia in its proper sphere of dental and medical science.

It must be a great source of satisfaction to the early members of this society, to feel that our progress has been uninterrupted by personal ambition or politics, and may I impress upon the members today the necessity of continuing our sincere, broad, liberal, and honest efforts, that our progress may continue, as we are but a young profession, with a great many avenues open for advancement.

In conclusion, I wish to carry out a request of our first president, who said that in the deliberations of this society now and hereafter, let us not forget the debt we owe to many noble men who have worked so earnestly in this our chosen field, and who, though often seriously hindered, have assisted in developing orthodontia.

He mentioned with tender reverence the names of Drs. Fauchard, Schange, Fox, Harris, Westcott and McGill; and the living shining lights in orthodontia in those days were Kingsley, Baker, Guilford, Brady, Case, Matteson, Ottolengui, Jackson, Farrar and Goddard. To the list I wish to add the names of presidents of this organization and some of the men who have contributed to orthodontic literature and technic.

I thought it might be of interest to throw upon the screen as many slides of these men as it was possible for me to obtain: Edward H. Angle; A. W. Kingsley; J. N. Farrar; S. H. Guilford; V. H. Jackson; Henry S. Baker; R. Ottolengui; Calvin S. Case; Milton T. Watson, president, 1903, 1912; Lloyd S. Lourie, president, 1904; H. A. Pullen, president, 1907; C. A. Hawley, president, 1908; F. M. Casto, president, 1909; B. F. Gray, president, 1910; A. P. Rogers, president, 1911; B. E. Lischer, president, 1913; Guy S. Hume, president, 1914; F. C. Kemple, 1916; M. N. Federspiel, president, 1917; D. W. Flint, president, 1918; J. L. Young; Martin Dewey; and Fred S. McKay.

#### DISCUSSION

*Dr. C. M. McCauley, Dallas, Texas.*—We have had the pleasure of listening to a most excellent address which contains sufficient texts for a number of sermons. In fact, I have never heard an address delivered by a president of this association that did not contain texts for a great many sermons which should be preached not only to the members of this society but to the entire dental profession.

One unfortunate thing with reference to the proceedings of this society is that they can not reach the entire dental profession, not because the average general practitioners need the knowledge that is here disseminated to use in their own practice, but because they need to know that it does not belong in their practice.

I have jotted down three points on which I expect to base the few remarks which I have to make. The first is education, upon which the president dwelt at length in his address. The second is prevention, which he has also touched upon; and the third, association, in which all of us should be interested.

So far as education is concerned, you will all agree that it is one of the great handicaps with reference to the specialty of orthodontia. The country practitioner, the rural man, is not as a rule educated in orthodontia, and he is not sufficiently educated in many cases to know that he is not educated in orthodontia. In many of these cases the patients who fall into their hands suffer. The average man who follows general practice has no business trying to follow orthodontia, and one of the burdens of this society is to teach the



young man that if he is engaged in general practice he can not successfully follow orthodontia as a specialty. The field of the dental profession is too large for any man to master it all. At this time the profession of dentistry is divided into six or seven specialties, and the profession is learning that fact. The next problem is the training of men for these six or seven specialties.

Since there has been a four-year course for dental colleges in this country, I have advocated and favored the full dental course for three years, that is, three years devoted to general dentistry. During that time the student should be given a general idea of the whole of dentistry and should be studying his own qualifications, his own adaptability. His teachers can be helping him to make a study of himself and determine what particular line of dentistry his qualifications will best fit him for.

The fourth year should be devoted entirely to training that man in whatever specialty for which he is best fitted. You men as orthodontists know that there are a few men, if any, who are so gifted and possess sufficient qualifications to do orthodontia and practice the other specialties of dentistry and do them all well. So, if the young man learns in the early part of his career the line of work he is best adapted to, a long step toward a successful career will have been made. If it be teaching, let him devote himself entirely to teaching the science of dentistry. If it be orthodontia, operative dentistry, bridge work, or periodontia, let him learn early in his career that this is what he is fitted for, and he should devote his time to that work to become a real specialist in that line. I believe none of you will question the fact that the clientele that happens to come within that man's reach will be better off than they would have been had he gone on and tried to master and cover the whole field of dentistry. Of course, these remarks only apply to the man that is now a student and those who are yet to begin the study of dentistry. The situation as it exists among the practitioners in the dental profession today also needs attention.

The man who comes to the city from a rural district, to take a short course which he calls a postgraduate course, goes to a school where the whole curriculum is covered in thirty days. As a matter of fact, no school can cover a curriculum like that in an efficient postgraduate course in thirty days. It seems to me, postgraduate courses could be vastly improved if every school had six schools within itself; for instance, the Washington University School of Orthodontia, headed by the dean of the institution, with the specialty school headed by a man recognized the country over as a specialist in that particular line, and so on through the entire list of specialty schools. When a man comes for a course of postgraduate instruction, let him take whatever courses he prefers; let him spend six weeks or two months in studying a particular line of work. If he wants another course, let him remain longer in the same school. Throughout the five or six different specialty courses that man can stay long enough to get what he wants, learning what he can do himself efficiently as well as learning what he should refer to the specialist. A postgraduate course for the general practitioner arranged after that plan is an improvement over the postgraduate course which is given in thirty or sixty days' time. The general practitioner who wishes to specialize should take the fourth year, or specialty year, in the regular course if laid out as referred to above.

I have a vision of a time in the future when orthodontia will not be practiced as much as a corrective measure, but will be more in the line of prevention. I look for the day to come when possibly orthodontists will begin to receive these cases for treatment in the embryonic stage by attending to the mother's diet and keeping the life forces at the highest pitch in the mother, and if possible, arrange so that food given to the child may be natural food. The natural food the child may get during its infancy and younger days will certainly have a wonderful influence towards the development of the teeth and bones. The little fellow of four or five years who has not received this attention, who has not had the proper nourishment, or from some other unknown cause, may not have the mandible developed, as shown by failure of the temporary teeth to space properly between the ages of four and six years.

This is the age and now is the time when the general dentist ought to know that something should be done to stimulate proper development. Instead of that, the rural dentist perhaps never sees the child until the second teeth come into place, or out of place, and then nine times out of ten he advises the parents to wait until the child is twelve or fourteen years of age. The rural dentist needs education sufficient to teach him when the proper time for development of the mandible has arrived, and if spacing does not occur, it is important to send the child to a specialist promptly, before malocclusion really appears. The educated orthodontist will supply the forces which the vital force of the child has failed to supply and the permanent teeth may be directed into proper place with less difficulty.

I have appreciated for several years the good work this society has been doing. The product of this society has been confined too closely to its membership; others have not profited as they should by the work you men have been doing. You know that in the last generation, and especially in the last few years, yes the last few months, questions have ceased to be local ones; that matters have ceased to be local matters; that things have taken on not only a national but an international phase; in other words, a world-wide phase. If we teach things in this society which are good for us and good for the small percentage of humanity with whom we come in contact, they should be just as good for the rest of the race. I do not doubt that I speak the truth when I say that this society is one of the leading societies in its line, and if that be the case, would it not be well for the product of this society to be distributed over more than a local territory?

We have nations to the south of us whose interests and needs are the same as our own. The science of orthodontia is younger and less advanced than in our own country, and it has seemed to me for many years that in view of the rapid progress of dentistry and the dental specialties in this country, it would be a good thing from the standpoint of learning and fraternalism, for societies of this character in this country to invite the countries south of us to send representatives and meet with us. I have had some correspondence with some of the men in those countries and I am sure they would be delighted to receive an invitation from us to send representatives and join their forces with ours. Some of these men would become valuable members, and the sum total of their labors added to our efforts should result in greater blessings for us all and should add glory to our cause in the western hemisphere.

*Dr. William C. Fisher, New York City.*—I remember Dr. Kells last year in Chicago in answering Dr. Ottolengui's remarks made in the discussion of his paper said to him when he got through, "I don't care what you say, Rod, you are wrong." There was one point in the president's address or in the remarks of the gentleman who has just preceded me of which I can say, "I don't care what he says, he is wrong." He is wrong because he never was right. When a gentleman says that a general practitioner of dentistry has no right to practice orthodontia he is wrong, because he never was right. He has a right to practice orthodontia if he wishes, just as much as any so-called specialist. In fact, he is legalized to practice it in every state, and we hear the statement made so frequently "he has no right to practice orthodontia" until it is coming to be an abomination to human intelligence. The point is this: The general practitioner of dentistry may not be qualified to practice orthodontia, but he has a right to practice it, and if he is not qualified to practice it, the fault lies with the educational curriculum. And this society, as I stated last year and the year before, has to share its portion of the responsibility if the general practitioner of dentistry is not qualified to practice orthodontia. But let us stop saying that these practitioners have no right to practice orthodontia, because it makes them dislike us instead of coming to us for knowledge or enlightenment. Let us impress them with the fact that they are not qualified to practice it, and that we are willing to teach them, and they will come to us.

I agree with a great deal that has been said in reference to postgraduate work. Our Educational Committee should thank the gentleman for giving us many suggestions we can use in our committee report which we have not been able to compile.

He speaks of the fact that the rural man, the man living in a small district, should be educated. First of all, he makes the statement that the general practitioner has no business to practice orthodontia, and then he says he should be educated, (with which I agree), but you can not educate him in a specialty just far enough to convince him that he can not practice that specialty. You say educate him far enough to be able to differentiate cases so that he may send them to you. That, I fear, will never go. I take it, when a man comes to you from the rural district he looks to you for education and enlightenment in the modern science of orthodontia in order that he may practice it, and if you do not hold out to him the possibilities and prospects of practicing that specialty, he certainly will not come to you for knowledge. He may come to you for knowledge and gain sufficient of it to convince himself that he is not qualified to practice, but you can not give him a smattering education and expect to convince him that he is not qualified to practice something. Qualify him and he will then know his own limitations.

## PREVENTIVE ORTHODONTIA IN EARLY CHILDHOOD AND THE MANAGEMENT OF CHILDREN\*

HERBERT A. PULLEN, D.M.D., BUFFALO, N. Y.

LOOKING backward from the present day practice of early treatment of malocclusion, it is a far cry to the days of almost a quarter of a century ago, when the patients of the few orthodontic specialists consisted entirely of adults. The diagnosis and treatment of developing malocclusions in children had hardly been touched upon at that time, and the common advice of the dentist to the parents of children afflicted with malocclusions was to "wait until the permanent teeth were all erupted" before any corrective methods were started, a sparring for time piece of advice that at least afforded the dentist who proffered it a chance to temporarily evade the responsibility of an intelligent decision in regard to a case, and, if the dentist was beyond middle age when he gave the advice he would in all probability have one foot in the grave and be incapacitated for active practice when the patient, grown up, and with the permanent teeth all erupted should reappear for the treatment of the malocclusion.

Of a similar purport with intent to shirk responsibility by procrastination as a shield for ignorance is the advice to "let Nature alone and she will correct the malocclusion," with the result in most cases of the development of a serious malocclusion confirmed by long years of arrested or deficient growth of the dental arches, while the child is allowed to patiently wait without avail for Nature to begin her corrective operations.

Another fallacy of early dental origin is the theory of "extraction to make room" in the dental arch for teeth which are out of alignment. The advice thus freely given seems to have been handed down or inherited from one generation of dentists and their patients to another, so that, even at the present day, it not infrequently crops out in unthinking repetition of time-worn and obsolete phrases such as have been quoted.

In order to contradict this erroneous advice it is necessary to substitute certain facts gained from long orthodontic experience for the fallacious theories presented at the beginning of this essay. To begin with, it must have occurred to the most casual observer of today that the chief aim of both medical science and its branch, dental science, has changed from curative to preventive methods of treatment.

If this aim is to be carried out consistently, it follows that in order to prevent disease or deformity the beginning of all preventive and prophylactic measures must be directed upon the human organism from the time of its earliest infancy. "From the cradle to the grave" has now become the motto of the health hygienist, and thus it is that the child, and its environment, its work and its play, but chiefly its health, is the center of all absorbing interest in all branches of medicine, especially in orthodontia.

\*Address delivered before the Toronto Dental Society at the King Edward Hotel, December, 1918. Published with corrections by permission of *Oral Health*.

The ideal physical condition which we all have in our minds as possible for the child is represented by such a state of normality of bodily function and structure that there is no room left for disease.

This mental ideal of the normal, physically perfect child encompasses health, beauty, and happiness. When one considers the charm of a well proportioned and well balanced face, with a winning smile, and displaying a beautiful row of pearly teeth, the mental picture becomes extremely fascinating.

Evidences of faulty respiration or of undeveloped and asymmetrical dental arches are inconceivable in the perfectly normal face; in fact, the whole external face reflects the evidence of an anatomically perfect internal face, with well developed dental arches, well developed nasal passages, and a healthy tonsillar ring. A step farther, and we may read as well a normally healthy body in its entirety, and a healthy mind, the expression of which is complete and care-free happiness.

Every mother desires such a delightful combination of health, beauty, and happiness for her children, and is willing to undergo any sacrifice to obtain it, but many mothers are doomed to disappointment, for either through hereditary influence or some acquired physical defects, the consummation of ideal physical perfection and beauty seems impossible in child development in many cases, except under peculiarly advantageous circumstances.

Beauty of the face is a composite of normally developed, well balanced features, and no one part of the face lends more attractiveness to this composite picture than perfectly developed teeth and dental arches, and no other part of the face can so deform and make ugly the lines of an otherwise beautiful face as the crooked, irregularly placed, or protruded teeth so often noticed in the mouths of children.

Take as an illustration a child exhibiting a malocclusion which is extreme in its manifestations of oral and facial deformity, and hardly amenable to corrective treatment because of the profound disturbance of bodily functions as a whole, a condition belonging to a type of cases which are occasionally observed in practice. The facial configuration of such a case is pathetically distressing with its open, drooping mouth, protruding teeth, and inharmonious facial lines, exhibiting a typical dullness of expression.

In this type of case the nasal passages are undeveloped, the nasal septum deflected, the turbinates enlarged, adenoids and enlarged tonsils are in evidence, the hearing is impaired and there is a muffled tone to the voice. Further examination of such a child usually reveals a narrow chest, and consequent lack of respiratory function, a stunting of growth and underweight, all evidences of a hard struggle for existence.

This is not an infrequent history, though in some cases it is perhaps less marked, of many of the children who are suffering from what has been aptly called the "vicious cycle" in the oral and nasal cavities.

However successfully the rhinologist can remove adenoids, tonsils and nasal obstructions for the restoration of normal nasal respiration and ventilation and drainage of the nasal sinuses, and the ophthalmologist relieve eye strain and assist in the proper correlation of eye functions, there still remains a further field of operations in orthodontia, which, because of its possibilities of

assisting in the development of the internal and external face, because of its stimulation to bone building in the maxillae and superimposed structures of the nose, and its consequent restoration of the functions of nasal respiration and normal occlusion, bids fair to fill an unique and highly important place in its possibilities of further physical benefit to the child.

But at this point it should be emphasized that the greatest benefit from orthodontic treatment is obtained in the early years of childhood, when such pathological changes as arrested development of the maxillae of the nasal structures are first apparent, and before these conditions are confirmed by several years of mouth breathing with its many ills, and before abnormal development of the internal and external structures of the face have shut the door to the best opportunity for effective treatment.

With added years the long continued effect of faulty respiration and lack of full function of the organs of the internal face, because of nasal obstruction, mouth breathing and malocclusion of the teeth results in the extreme of abnormal conditions in adult life. The lines of the face become sadly out of balance, the teeth are protruded, and the chest often is caved in. Such a case is manifestly too mature for ideal treatment, for although improvement in occlusion might be obtained, the bone is too dense for development of the dental arches and superimposed nasal structures, and it is obvious that the patient has waited too long before commencing corrective treatment.

However, in the treatment of a young child having the severe type of malocclusion associated with respiratory troubles, very pleasing results may be obtained in dental arch development, in better breathing conditions, a relief from the dull expression of mental hebetude, and the restoration of beauty to the face.

It must be evident to the close observer that malpositions of the teeth, generally speaking, are but objective symptoms of abnormal development of the dental and maxillary arches, usually exhibited in an arrest or deficiency of development, such as contracted arches with not enough room for the permanent teeth to erupt without crowding some of them out of alignment. In a simple case of deficient development of the dental arches, there is crowding of the teeth and overlapping in their effort to erupt in dental arches which are too small for them. A consistent corrective treatment should be begun during the growing age of childhood when a very pleasing result in the development of the dental arches and restoration of normal occlusal relations may be obtained.

Whether or not the general practitioner of dentistry ever practices orthodontia, it is essential for his professional reputation that he does not err in his advice to parents regarding the incipient malocclusions in their children's mouths, but he should either institute corrective measures himself in these cases or refer them to the orthodontic specialist as early as the malocclusion becomes evident.

The time when corrective treatment should be begun has somewhat definitely arranged itself. Since the roots of the deciduous molars enclose the crowns of the permanent bicuspid, any lateral pressure exerted in the expansion of the deciduous arch is transmitted to the permanent bicuspid, and it is therefore advisable to begin operations for the expansion of the deciduous dental arch some little time before the loosening of the deciduous molars preparatory to their being shed, or else the looseness or absence of these deciduous teeth will

postpone any attempts at arch expansion until the full eruption of the bicuspid, some time later.

Thus, in the anterior development of a lower dental arch, begun at the age of eight years, the deciduous cuspids and molars are intact and their roots have not begun to absorb, so that they afford a firm support for the appliances which may be adjusted for anterior arch expansion necessary because of the closing up of the erupting space of the permanent lateral incisors, often due to the premature extraction or loss of the deciduous lateral incisors.

Premature loss of the deciduous teeth in this manner should be provided for by the mechanical retention of the space necessary for the eruption of the permanent successors, otherwise the dental arch will contract in the spaces of these teeth, leaving no room for their eruption. The banding of the deciduous cuspids, and connecting these bands by a lingually soldered retaining wire, will prevent the malocclusion from developing, and is an operation that any dentist can easily perform.

In the event of the premature loss of a molar in the deciduous arch, as occasionally happens through necessary extraction, it is always advisable to guard against the subsequent contraction of the dental arch by holding the space of the lost tooth open by means of bands on the teeth on either side of the space connected by a lingual wire.

The prolonged retention of deciduous teeth works almost as much havoc in the developing permanent arch as the premature loss of these teeth, and the mouths of children should be carefully watched for such abnormal conditions. The most common instance of this condition is observed in the retention of the lower deciduous central incisors beyond the time for their natural absorption, their roots being unabsorbed and deflecting the erupting permanent centrals lingually. If there is room for the permanent incisors to erupt, the only operation necessary is the extraction of the deciduous centrals when the permanent centrals will of their own volition grow forward into the space.

The prolonged retention of the deciduous lateral incisors often deflects the crowns of the permanent laterals lingually, indicating the necessity for the immediate extraction of the deciduous lateral incisors, and possibly the slight expansion of the dental arches to obtain sufficient room for the eruption of the permanent lateral incisors into position.

The prolonged retention of the deciduous cuspids or of the first or second deciduous molars, when there is no evidence of the approaching eruption of the permanent successors, is a matter of some concern, since the germ of the succeeding permanent tooth is occasionally absent, and the extraction of one of these teeth without an x-ray diagnosis, showing the presence of the succeeding permanent tooth, would be questionable practice. In the absence of a permanent successor, as shown by the x-ray, the deciduous cuspid or molar usually does not suffer from the absorption of its root, and may do good service for a lifetime if properly cared for.

A case in point is one in which the dentist consulted me as to the advisability of extracting the deciduous second molars, they having been retained beyond the period of their natural loss. I made a radiograph of both lateral halves of the upper dental arch, and finding the permanent second bicuspid missing, ad-

vised the preservation of the deciduous second molars, and they have done good service for many years since the advice was given.

Supernumerary teeth are not infrequently the causes of malocclusion, which the dentist can prevent by the extraction of these teeth before they can cause a deflection or transposition of the permanent teeth.

Occasionally a supernumerary tooth will erupt alongside the normal tooth, which it will very closely resemble, and, as in a case, in which the normal lateral and the supernumerary lateral are so much alike in the form of their crowns that it is necessary to make a radiogram of their roots to determine which one to extract and which one to preserve.

The extraction of the first permanent molar is a common cause of malocclusion, for the teeth on either side of the space of the lost first molar drift into the space, and the dental arches collapse, causing malocclusion, in the same manner that an arch of masonry collapses when the keystone is removed. If I could leave with you one thought which I would wish to impress more than another it is this—*Guard the first permanent molar from the ravishes of caries from the moment of its eruption until it is safe from caries in the sulci and from caries caused by contact with the too often carious distal surface of the second deciduous molar.* It has been my experience that altogether too many first permanent molars have been lost, with consequent serious malocclusions resulting because of the lack of frequent dental care of these teeth.

Now, having pointed out a number of the so-called local causative factors of malocclusion, and suggested methods of prevention of serious malocclusion resulting therefrom, I wish to say a few words as to the management of children in office practice. It might be asked why it is that the dentist often dreads the necessary visits of children, while the orthodontist looks forward to their coming with pleasure. The reason for this is probably because the dentist's work is associated with more or less pain, while the orthodontist is able, through the use of delicately constructed and skillfully applied appliances, to avoid pain. If it were possible for the dentist to fill the cavities of deciduous teeth without any more pain than the orthodontist causes in fitting bands to the teeth, the children would not be so averse to the dental chair, and the dentist would take more pleasure in his work for the children.

There is a difference in the way different dentists handle children also; in a community one or two dentists will get a reputation for the skillful handling of children, due, no doubt, to their love for or better understanding of children, and for their avoidance of pain in caring for their teeth.

Fear, if present, should be banished at the first visit of the child, and, once banished, it should never be allowed to return through any rough handling or carelessness on the part of the operator. Tears are always near the surface in children, and are always the signal for an immediate armistice and cessation of hostilities as it were, when the cause of the tears may be discovered, and by means of a diversion of a frivolous nature, equilibrium of emotions is once more restored, and the work finished with a careful avoidance of the incident which caused the tears.

It is all a matter of psychology in dealing with children; their minds are like an open book, very impressionable, ready for suggestions of a nature which will

interest and please them, and if their thoughts are directed in the right channel they will forget that they are in a dental office, and will fill the office with their sunshine and laughter, and often drive away a fit of the blues.

Can you imagine a child with a mouth full of a plaster impression laughing until the tears ran down its cheeks? That happened in my office this last week, and was a pleasant diversion, although an impression need never cause any fear or disagreeable sensations if carefully and scientifically done.

Find out what is occupying the child's interest at the time, and converse with it on that subject, adding the ideas which it is looking for, stimulating its enthusiasm, thus proving to them that you are deserving of their confidence, and in the meantime, gaining their friendship.

Often a child will come in with a big idea; help him along with it. He will forget all about the office and everything that might be disagreeable about it in a few minutes, and your work will go along smoothly to its completion without a ripple to mar the surface. To illustrate, one of my little patients, a boy who usually has to be constantly watched because of his fidgety actions and boisterous behavior, announced to me when he came in the other day that he was going to be an inventor, his father having bought him a bench with a number of tools to work with. He and his companions had formed an inventor's club, and were going to invent things and make some money on them. I immediately encouraged the idea, showed him some inventions of my own, and finding that he did not know what to invent first, suggested to him that I needed a small white enamel waste receiver attached to the cabinet, to be worked with a foot lever much as a surgeon's waste receiver is operated.

He fell for the idea at once, saying that his mother had an old flour can which he could use to start with, and when they got things going they would give me one, I having told him of the possible great demand for them by the dental trade, and of the possibility of making some considerable money in selling them. We have established a relationship of camaraderie, based on business presumably, which will probably last until I can complete his case, but giving me a control over his actions which I could not so easily obtain any other way.

Suggest to the children the subject of conversation while in the office, and, if you are keen, you will find a way to interest them along lines they unconsciously suggest to you.

The mysterious always appeals to them, and a few sleight-of-hand tricks will not come amiss. Lighting the gas with a pencil attached to the electric lighting current never fails to elicit their interest and admiration. Pumping up the chair or running the dental engine often serves a similar purpose.

Stories have a remarkable effect, and it is well to keep a stock of them on hand for purposes of diversion. The office magazines should be chosen with the idea of interesting the children rather than the adult entirely. Even the furniture may be selected with a view to their needs, especially in an orthodontist's office.

It must be remembered that the child lives in a little world of its own, a world of effervescent joy and happiness, a combined mixture of birthdays, Christmas and other holidays, bed-time stories, candy, cake and ice cream, picnics and games.



For the adult to enter their little world means the discarding the mask of maturity, and donning the mask of youth, entering through the gateway of sunshine and laughter, frivolity and mirth, affection and sympathy, and conducting a children's hour in the office with that supreme understanding of the heart of a child that is expressed so nobly in the words of Longfellow:

Come to me, O ye children;  
And whisper in my ear  
What the birds and the winds are singing  
In your sunny atmosphere.

For what are all our contrivings  
And the wisdom of our books,  
When compared with your caresses  
And the gladness of your looks?

Ye are better than all the ballads  
That ever were sung or said:  
For ye are living poems,  
And all the rest are dead.

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## A METHOD OF MEASURING THE RELATIVE HEIGHT OF THE PALATE

BY ROBERT W. GASTON, D.D.S., NEW ORLEANS, LA.

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**I**N the correction of the cases of malocclusion in which there is a very decided narrowing of the upper arch, with its accompanying high palatal vault, it has, heretofore, been difficult to determine, after completion of the case and widening of the arch, whether the palate has actually been lowered or whether it simply has that appearance because of the dental arch having been widened.

Of course, by taking measurements from a horizontal plane passing through the occlusal surfaces of the molars to the highest portion of the palate, one can determine whether or not this line has been shortened because of the treatment, or, in other words, whether or not the palatal vault has been brought any nearer to the horizontal plane passing through the occlusal surfaces of the molars; but this measurement will not necessarily determine any change in the actual position of the palate as related to the rest of the skull; but simply the change of relationship that has taken place between the dental arch and the hard palate.

In making the measurements with the method that I have reference to, for the purpose of determining what actual changes take place in the height of the palate in its relation to the rest of the skull; I have selected two points, from which to measure, which are about as nearly fixed points as one can select; viz., the lower border of the external auditory canals, posteriorly, and the septum of the nose on a line with the lower border of the nostrils, anteriorly.

Now, considering that these two points are fairly well fixed, if we could draw a line from the anterior point of measurement at the base of the nose, to a line

joining the posterior points of measurement—the lower borders of the external auditory canals, we would have a fixed line from which we could make measurements that would determine any change in the height of the palate as related to the rest of the skull. In order to do this, I have made use of the face-bow as used in prosthodontia (Fig. 1). I have, however, made an addition to it, in the form of a set-screw placed in the shaft of the mouthpiece, (*a*, Fig. 1) which is to be screwed up and set at the location of the anterior point of measurement—the base of the nose.

In taking the measurements, an impression of the palate and occlusal surfaces only, of the teeth, is taken by placing softened modeling compound upon the mouthpiece of the face-bow and pressing into place, being careful to press it into the highest portion of the palate; it is then chilled, removed and carefully laid aside (Fig. 2). A mark is next made on each side of the face just in front of, and on a line with, the lower border of the external auditory meatus (*b*, Fig. 1);



Fig. 1.

this is for the purpose of acting as a guide in placing the face-bow in position to secure the posterior point of measurement.

The mouthpiece, with impression, is then accurately replaced in the mouth and the patient or an assistant instructed to hold it in position by placing the finger in the center of the mouthpiece; the bow is now placed in position with the upper borders of the posterior ends placed directly on the marks that have been made upon each side of the face (*b*, Fig. 1), and the anterior portion placed over the rod of the mouthpiece; the impression is pressed tightly to place in the mouth, the set-screw of the bow (*c*, Fig. 1) is screwed up tightly upon the rod of the mouthpiece so as to hold their relations securely; the small set-screw, which has been added to the rod of the mouthpiece, is now screwed up until it touches the base of the nose on a line joining the lower borders of the nostrils (*a*, Fig. 1). The entire appliance—face-bow, mouthpiece and impression, is now removed, being careful not to alter the relations of any of the parts.

This now gives us an anterior and a posterior point from which to measure the position of the palate.

The point of the set-screw indicates the anterior point of measurement at the base of the nose, and, by joining the two condylar ends of the face-bow with a straight line, we have the posterior point of measurement, represented by the center of this straight line. This line may be simply a small wire joining the two condylar ends of the face-bow running just over the upper borders of these ends, as indicating the position of the lower borders of the auditory canals.

Now by placing a straight-edge from the tip of the set-screw anteriorly to the center of the wire posteriorly, we have the fixed line from which we can meas-

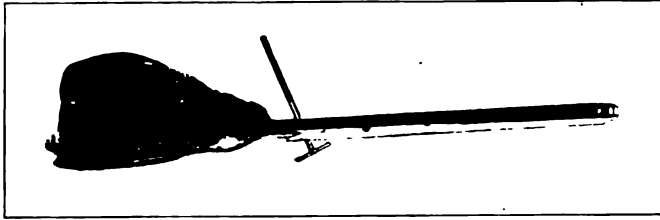


Fig. 2.



Fig. 3.

ure the distance to the highest portion of the palate as given in the impression (Fig. 3).

In those cases which I have measured, so far, of fairly normal mouths, the highest part of the palate has ranged from two to four millimeters below this fixed line, which, after allowing for the thickness of bone comprising the palate and floor of the nose would seem to indicate that the latter is almost directly in this line. I have not, however, used this method long enough to determine what change, if any, has taken place during the treatment of cases of malocclusion.

# DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

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It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

## STEREOSCOPIC ROENTGENOLOGY—STEREOGRAPHS\*

BY C. EDMUND KELLS, D.D.S., NEW ORLEANS, LA.

### NOMENCLATURE

**I**MMEDIATELY upon Roentgen's discovery of what he modestly termed the "x-ray," by means of which it became possible to take pictures of the invisible, it became necessary to give these pictures a name.

Skiagraph, skiagram, radiograph, radiogram, and others were suggested, and in this country the first name was the generally accepted term, for the first few years after the discovery of the x-ray.

Skiagraph is from the Greek, means shadow picture, and these are shadow pictures and nothing else.

A disposition was also shown by the early workers to honor the discoverer in this matter, and Roentgenogram and Roentgenograph were suggested, but these were time-consuming terms, and anything but euphonious words, and so, as has just been stated, the term skiagraph was mostly used. Later on, however, radiograph began to be used as well, and today both terms are generally used.

However, there was soon organized (about the year 1900) a society known as the American Roentgen-Ray Society, of which I was an early member. This association is in existence today and is composed of physicians who specialize in the use of the roentgen ray, so that the choice of the nomenclature of the science naturally falls within its province.

The American Roentgen-Ray Society is composed of roentgenologists. Its official organ is *The American Journal of Roentgenology*. When exposing plates

\*Read before the Eighteenth Annual Meeting of the American Society of Orthodontists, Chicago, July, 1918.

to the influence of the x-ray, its members produce roentgenograms. At other times they use the roentgenographic methods. Roentgenoscopy is probably daily saving the lives or limbs of some of the best of those who have gone "over there." "Roentgenotherapy" is now practiced practically all over the world, or if not quite that, then at least everywhere where it is worth while.

While all this is true, yet there is no law in existence making it a misdemeanor for a dentist to call his roentgenogram, a radiograph or a skiagraph, or anything else he may choose to miscall it, and, likewise, when he writes a book he can also give to it any title he may select, but when we meet with such a one as "Oral Roentgenology," then we recognize the fact that its author, at least, believes in correct nomenclature.

As for myself, I apologetically admit roentgenogram always was "too many" for me, and so I always have used skiagraph, and probably will keep on with it till the end.

However, a strange occurrence can now be reported in this connection. Just before this country joined in the world-wide conflagration that is now going on, the "Intellectuals" of Germany, as they were called, and who were some ninety in number, signed a statement upholding the Kaiser in his course and approving of his conduct toward Belgium.

Now, as a rule, the ultra-scientist is no respecter of creeds, religion or politics, and mixes with neither, and, therefore, when these ninety "Intellectuals" thus went out of their sphere, it produced a mighty impression—and a mighty unfavorable one as well—upon the intellectuals of other countries, and since then there has been a tendency to drop everything that sounds German, and so today the word *skiagraph* is slowly replacing roentgenograph among roentgenologists. (This, of course, is only hearsay.) Whether or not they will ever succeed in getting away from the present very German nomenclature remains to be seen.

So while the invitation to be with you here this evening called for a demonstration of stereoscopic-radiography, it is to be hoped that the same demonstration under a different name will be acceptable—"A rose by any other name would smell as sweet."

When stereoscopic work was first undertaken, a shorter term than "stereoscopic skiagraph" was necessarily required for its description, and so I adopted the word "stereograph," which I have used ever since, and trust it will be acceptable to this society.

#### DENTAL SKIAGRAPHY

When a properly prepared and protected photographic film is placed within the mouth and duly exposed to the influence of the x-ray, a plain shadow picture is the result, which, while limited in its character, is usually valuable to the dentist.

If we now apply the laws which govern stereoscopic photography to this same work, we increase the value of our pictures a hundredfold and even more, or, to be more precise, there is absolutely no comparison between a plain skiagraph and a stereograph, for while in a given case a plain skiagraph may happen to be of absolutely no value, a stereograph may reveal the conditions sought for.

## DENTAL STEREOGRAPHS

All that it is really necessary to know now about this work is that two ordinary skiagraphs of the region involved must be taken upon separate films from points about two and one-half inches (the pupillary distance) apart. The distance from the film to the tube does not appear to affect the result, but probably from ten to twelve inches is the best measurement for this line.

The patient must not move during the process of changing the films, and the second film should be placed in about the same position as the first and *exactly upon the same plane*. Here lies the difficulty in taking many dental stereographs upon films within the mouth.

These stereographs upon films within the mouth were first taken by me more than sixteen years ago. It is unnecessary to occupy valuable time by the recital of the many trials and tribulations which were undergone, or to describe the various complex and difficult stages which were successively gone through with before this simple method now used was finally devised.

Fig. 1 shows a plain, everyday skiagraph, and before this picture can be of any use it must be interpreted. As a matter of fact, we hear much these days



Fig. 1.

of the correct *interpretation* of skiagraphs, but the correct interpretation of the skiagraph is frequently a very uncertain proposition.

The reason Fig. 1 requires "interpretation" is that it is merely a shadow picture—does not explain itself upon its face—and as a matter of fact, it is impossible to make a correct interpretation because no one but the man who took it can recognize the actual conditions which it portrays. He and no one else can correctly interpret that particular picture.

Generally speaking, one could safely say that he recognizes the shadows of an upper central, a lateral and a cuspid. We have all seen so many pictures similar to this one that it would probably be safe to go into court and swear to these facts.

But what about the shadow which *may* represent a wire running into the root canal of the lateral? Where is the man who, looking at this picture for the first time, can go into court and swear whether the wire lies mesially or distally to the tooth, or in its root canal? Such a man can not be found, because in either case the shadow would be the same, and it is impossible to tell *from the picture* the relative position of this wire to the tooth.

To prove this statement, we will now look at two skiagraphs of the same

tooth, with a wire in different positions (Fig. 2, *A* and *B*), and no one can tell the difference between them, or the relative position of either wire.

But pair the picture shown in Fig. 1 with its stereoscopic mate, place them in their proper positions in a stereoscope, and after careful examination, there probably is not a man in this room who could not go into court and swear just exactly where the wire was when the picture was taken. This shows the value of a stereograph.

Let me quote from a paper which appeared in the *Dental Items of Interest*, February, 1917: "The writer firmly believes that stereographic work is not generally done by the strenuous advocates of x-ray work (this referred to root canal artists), because it is comparatively difficult.

"For illuminating a case under consideration, a plain skiagraph will com-

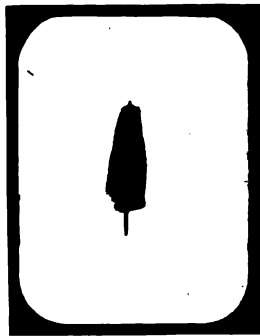


Fig. 2-A.

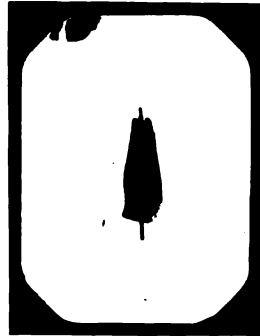


Fig. 2-B.



Fig. 3.

pare to a stereograph about as the moon on a cloudy night compares to the noon day sun in a cloudless sky, and he firmly believes that just as soon as some one discovers an easy way to take and view stereos, the plain skiagraph will be immediately abandoned and stereos will be used exclusively by any essayist who desires to illustrate his root canal work."

That was written some eighteen months ago, and mark well those words tonight—just as soon as that *easy way* is found, no orthodontist will again rely entirely upon the plain skiagraph, for to none of us is the stereograph more valuable than to these self-same orthodontists.

Who would look at these pictures (Fig. 3) and imagine that they are of one and the same tooth and taken within five minutes of each other? And yet

they are. This is a splendid example of what different shadows the same tooth will cast upon films when the pictures are taken from different angles, and yet a stereograph of this case locates the embedded tooth clearly.

Again see Fig. 4 where two laterals are seen to be erupting. Here the plain skiagraph was absolutely valueless because of the superimposing of one root shadow over the other, so that they were indistinguishable, and yet a stereograph showed very clearly which was the supernumerary tooth and which was the permanent lateral.

The identification of the supernumerary tooth was based absolutely upon the evidence of this stereograph, and upon its extraction the postmortem proved the diagnosis to be correct.



Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.

In Fig. 5 is shown an unerupted cuspid, which, in reality, was in no such position as this misleading shadow would lead us to believe.

After a careful study of the stereograph of the case, a lancet was run down upon the point of the cusp *as intended*—not missing it by a hair's breadth.

Here in Fig. 6 is shown a lower molar, with its three root canals filled. The filling protrudes slightly through the end of one canal. There are two ways of finding out from which canal the filling does protrude.

1. Extract the tooth and hold a postmortem.
2. Stereograph the case.

#### IMPACTED MOLARS

There are many cases of impacted third molars both upper and lower, which absolutely can not be diagnosed by an ordinary skiagraph, and yet a correct diagnosis is of vital interest to the patient.



In Fig. 7 is shown such a case. This patient was about thirty years of age, and there was no visible evidence of the third molar. She was a stranger and came to have her mouth put in order.

The bridge partly shown was naturally condemned on sight, greatly to her surprise, as she thought it was such a fine piece of work and had never given her any trouble, and a skiagraph was taken in order to reveal the possible miseries hidden below. The impacted molar was thereupon accidentally disclosed.

Then came a history of pain and suffering in the back of her head and neck, for which she had been treated and treated off and on for years, all of which was undoubtedly traceable to this tooth.

The whole course of treatment must be decided upon by the actual relative positions of the second and third molars. If the third molar had burrowed its way into the second molar, the second molar should be extracted, whereupon the



Fig. 8.

third molar would eventually erupt and possibly become a useful member of the dental family.

But if the third molar lay either lingually or buccally to the second molar, then it, itself should be removed.

There were two methods of discovering the actual conditions:

1. Cutting down upon and exposing the third molar—not such a pleasant pastime for the patient if the process should show the second molar must be removed, and
2. The stereograph.

In this case the stereograph was taken and it was shown that the two mesial cusps of the third molar *straddled* the buccal corner of the root of the second molar. The third molar was thereupon cut down upon and removed, and, as far as could be observed, the second molar root had not yet been injured.

In Fig. 8 is seen an upper impacted third molar, a stereograph of which would be invaluable.

Many other such cases could be cited, but these should suffice to prove conclusively the advantages of stereographs.

#### THE TUBE CARRIER

Upon taking up the work of making dental stereographs upon films within the mouth, the first obstacle to be met was that of the tube carrier, as there were none upon the market at that time that were suitable to me, and so one was improvised, only to be changed from time to time.

One of the tube carriers devised for this work is here for use tonight, and will be described as used.

Before going further it might be well to call your attention to the fact that as the demonstration proceeds, it will be but natural for you to think, "Why is this particular detail done as it is?" and, "Why is not that particular step taken differently?"

The facts are, gentlemen, that there are many ways of varying each and every detail, and they have been changed frequently during the past fifteen years. But this evening there will be shown only one of the ways in which rather satisfactory dental stereographs can be taken, and is the way in which they are taken now-a-days.

#### THE FILM

The Eastman positive film is used for this work. It is ordered in the 4x5 size, which is well adapted to the purpose, as any size required for the case in hand can be cut from it.

#### PREPARATION OF THE FILM

We first cut two black paper patterns of just the size of the films to be used. We then cut two pieces of ordinary red dental rubber, just about one-eighth or one-sixteenth of an inch larger all around than the paper pattern, and we lay them on the black end of the preparation board. Next we cut two pieces of Doherty's No. 14 black dental rubber of the same size as the red rubber, and we lay them with the black paper patterns on the white end of the board. In the darkroom these various objects can be plainly seen against their contrasting backgrounds.

Four films are now cut exactly of the size of the paper pattern. One corner is clipped off from each of two films, so as to permit of their identification, and they are laid upon the red rubber, emulsion side up. The other two films are now laid, one over each of the first ones, emulsion side up. The black paper pattern is now placed over each film, and the piece of black rubber is placed over them. The edges of the red and black rubber are next pinched together with pliers, and we now have a waterproof, light-proof packet ready for use, the black rubber surface to be exposed toward the tube.

#### IDENTIFICATION MARK

Upon one corner of the black rubber of one of the packets is placed a small metallic letter *L*, or some other identification mark, and the films are now ready for use.

PREPARATION OF THE PATIENT (WIRING OF THE TEETH)

In the early days it was frequently found difficult to register the two stereographs when trying to view them in the stereoscope. Placing of fine wires around two of the teeth upon opposite ends of the region to be stereographed before the picture was taken, was found usually to overcome this trouble.

This method is used when no fixed planes are used. When a fixed plane or a tunnel is used it is better to secure a fine brass wire in some suitable place on it



Fig. 9.

instead of the teeth. The result is the same, and by doing so, the patient is spared the annoyance of the wires.

THE TUNNEL

A tunnel as here shown is made of aluminum. Soft modeling compound is attached to its lateral edges and adjusted in position in the mouth, while the modeling compound is still soft. The teeth are closed gently into it, thus holding it firmly in place.

The films can now be slipped in and out of the tunnel without much danger of the patient's moving.

ADJUSTMENT OF TUBE (FOR THE UPPER JAW)

The patient is now seated in a comfortable position and the head tightly bandaged to the headrest. To use the usual expression, the tube is now "focussed" upon the center of the region to be taken. However, as the x-rays



Fig. 10.

can not be "focussed," it would probably be more correct to use the word "centered."

In Fig. 9 is shown the stand used for taking stereographs and patient in position.

1 is a metal rod standing up in the center of the conventional tripod on rollers.

1 A is the clamp which secures the slotted upright (1 B) at any angle and allows it to be raised and lowered.

2 is another similar clamp, which in turn locks 3.

3 is a solid square wooden bar adjustable to any desired angle, and it slides up and down in the slot 1 B.

4 is a heavy section of wood fitted as shown to be the adjustable tube-carrier itself. It is shown slipped on to the square member 3.

4 A is another square hole standing at right angles to the first one. If the tube carrier 4 is secured to the square bar 3 by means of this hole, then we have the tube carried at right angles to the position here shown. It is in this latter position when taking stereographs of lower teeth. This double adjustment facilitates the taking of stereographs of various regions of the jaw.

5 is the sliding member which travels a distance of two and a half inches and supports the tube.

5 A is an ordinary tube clamp secured to 5, holds the tube firmly in position, and, of course, moves with it.

6 is a slot cut on a circle, so that when the tube is shifted, it travels along the segment of a circle.

The patient is shown with head bandaged to the headrest—tunnel and films in place ready for the left eye exposure.

In Fig. 10 tube has been shifted along the path of the circle two and a half inches to the right, and all is now ready for the right eye exposure.

In practice, the tube would be placed nearer to the patient and at a little different angle. If the actual pose for this picture had been made, the various details would not have shown clearly in the picture, but the principle is just the same, as was demonstrated at the meeting, when a stereograph of the upper third molar region was satisfactorily taken.

#### TAKING THE STEREOGRAPH

The proper adjustment of the tube having been accomplished, it is now shifted  $1\frac{1}{4}$  inches to the left, and the film bearing the letter L is slipped in position in the tunnel, and the tunnel placed in position in the mouth. The current is turned on, the exposure is made, and we now have the picture as seen from the left eye. The film is removed, its mate put in its place, the tube is shifted  $2\frac{1}{2}$  inches to the right, and the second exposure for the right eye is made. Care should be taken that both films are exposed equally. It is possible to take these stereographs by having the films held between the teeth without the use of the tunnel, and many have been taken in that manner.

Any region in the upper jaw can be stereographed with the films placed between the teeth in this manner, but when it comes to a region in the lower jaw, we are up against a different proposition.

Remembering that both films must be held upon the same plane, the method here used is as follows:

#### THE FILM HOLDER (FOR THE LOWER JAW)

In Fig. 11 is shown the various steps for making a guide plane for taking stereographs of teeth in the lower jaw.

(A) A piece of aluminum plate, No. 30, B. & S., is cut to this pattern.

(B) The slotted edge is then turned over to about a right angle and the lugs at each end bent over—all as shown.

(C) The slotted edge is then slightly warmed over a Bunsen flame and a piece of softened modeling compound is attached to it. This is placed in the mouth, plane surface pressed against the inner surface of the jaw and held there while the compound is moulded over the crowns of the teeth. The patient then closes down carefully upon it—mouth opened—the plane again

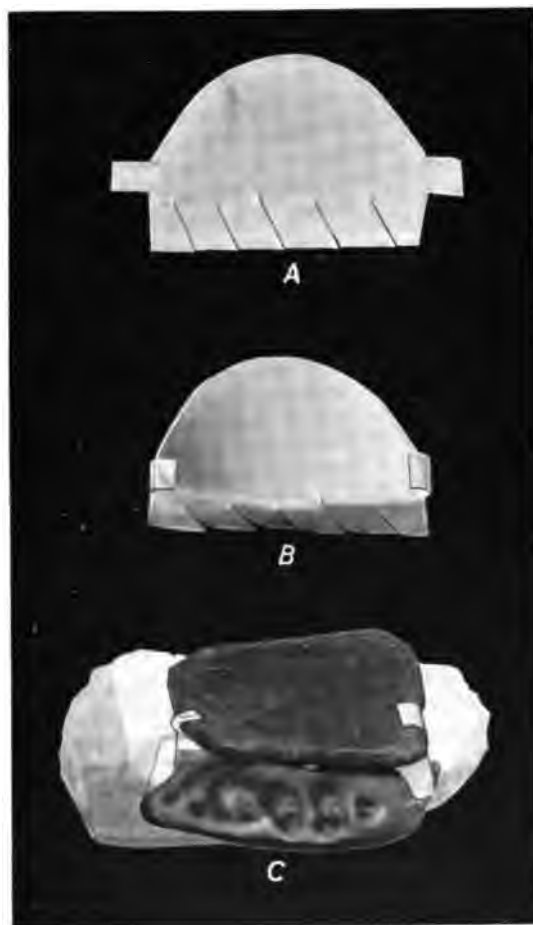


Fig. 11.

adjusted in place in case it had moved away during the occlusion. It is then cooled by means of a jet of cold filtered compressed air or a spray, and then removed. The finished plane in position on a model is here shown.

The films enclosed in black rubber, as previously described, have been clamped in place by the little lugs at each end.

The film holder is now placed in position in the mouth, the teeth closed gently against it so as to be assured it goes to place, and the exposure made. The plane is then removed, film taken off, another one put on, the holder re-

turned to the mouth, where it must be replaced in its exact former position, which is readily done, and the second film is thus held on the same plane as was the first, and the exposure made.

With the patient placed in a comparatively comfortable position, so that she can sit immovably during the process, and care being used to carry out these details without the loss of any unnecessary time, perfectly satisfactory stereographs can be thus obtained of teeth of the lower jaw.

#### DEVELOPING THE FILM

We now have two pairs of exposed films, and it is well to develop one pair first, using the utmost care to bring them to the same density, and the two pairs can be identified afterward by the one being clipped and the other not.

#### THE STEREOGRAPH

Each finished film is now placed between two pieces of glass of a suitable size and the edges bound with gummed paper, which renders them substantial, keeps them flat, and allows of their easy handling. They are then placed upon the top of the stereoscopic box, by means of which they are transilluminated. While adjusting the focus of the lens the films are carefully moved about until they register, at which instant their beauties burst forth.

By means of this stereoscope, a practical examination can be made in a very few moments after the films are dried, but one not accustomed to its use finds it rather awkward and unsatisfactory, and it is not a very satisfactory apparatus for exhibiting one's work to others.

To overcome these drawbacks, the stereoscope now shown was devised. The two films are first secured to a piece of glass in their proper relative positions and photographed on a plate. From this plate a transparency is made which fits this stereoscope.

This transparency can be quickly adjusted and viewed with satisfaction in any parlor stereoscope by anyone, but the special stereoscope here shown shows it to better advantage, as all side light is cut out.

#### MOUNTING THE FILMS

If the films are of just the right density, they may be properly placed upon a sheet of glass by means of gummed paper strips. All the rest of the plain glass is also covered with this same paper, and quite a satisfactory transparency results.

#### MAKING PRINTS

It is possible, of course, to make the usual prints from the films and place these upon mounts to fit an ordinary parlor stereoscope, but so much of the beauties of the original films are lost in the process that one hardly has the heart to spoil his work in this manner.

#### REVERSING THE FILMS

There is a most wonderful feature about this work. If the left eye picture is placed on the left, and right picture on the right of the stereoscopic box,

upon looking at them it will be found that we are looking through the jaw from the same direction that the rays were thrown. In this case, for instance, with the picture so placed, we appear to look down through the buccal plate, through the alveolar process, and so on. Everything appears just in these relative positions. As a matter of fact, these pictures present a *buccal aspect* of the case.

But let us reverse the pictures, placing the right eye picture on the left and the left eye picture on the right, and a most wonderful transformation has taken place, for now we are looking through the jaw from a position within the mouth and now they present an actual *lingual aspect*. Strangest of all is the fact that viewing pictures in this direction is the most satisfactory of the two, so that the pictures are always reversed for reading.

#### THE LINGUAL ASPECT

Mr. Chairman, did you, sir, ever go up to a fine old bull in the middle of a forty-acre lot with not a tree in sight, and shake a red flag in his face? No? Well, of course not. That certainly was a foolish question, because if you had done so, you would not be here this evening listening to this intellectual feast.

Well, at any rate, you well know that the bull's feelings would have been



Fig. 12.

somewhat ruffled at such a performance, and that's just what happens to me when a patient comes in, and produces a lot of *dental radiographs* labeled "Lingual Aspect" for my inspection.

We will now study two views of the same tooth (Fig. 12). The one is a "lingual aspect," according to the aforesaid *radiographers* and the other, therefore, must be a "buccal aspect," as it is the reverse of the first.

Is there anyone present who can tell which is which? Undoubtedly not, because both being merely skiagraphs, there is no appreciable difference between them.

Evidently there is a small filling in the tooth, and it could be on the buccal surface, or it could be on the lingual surface. Who is there here who will scrutinize these pictures carefully and venture an opinion as to which surface the filling really is upon? I hope some one who does this "lingual aspect" work will have the nerve to try.

Now, Mr. Chairman, the term "lingual aspect," as applied to a plain skiagraph, must be incorrect, and let us hope that all those who have used the term heretofore will discontinue its use in the future. It is certainly a reflection upon a man's standing to have such a misnomer accompany his work, and



unless he can differentiate between this buccal and lingual aspect of the tooth shown in Fig. 12, misnomer it must be.

However, to a stereograph there certainly are both lingual and buccal aspects, according to how you view them, as has already been explained, and there is no camouflage about that feature, as they are readily distinguishable from one another.

It is suggested that if your purely shadow pictures must have a label, that the words "buccal exposure" be used instead of "lingual aspect." By buccal exposure is meant that the buccal surface was exposed *directly* to the rays, and conversely, "lingual exposure," that the lingual surface was directly exposed.

The word *directly* is used with a purpose, as both surfaces are actually exposed to the rays as they pass through the tooth.

It would naturally appear that such terms, equally as distinctive, could be applied to nearly all parts of the body. Instead of saying that a skiagraph was taken *anteroposteriorly*, it would only be necessary to say *frontal exposure*. "Palmar exposure" of the hand would clearly and concisely indicate which surface of the hand lay against the plate, and so on.

A very great drawback to stereoscopic work is that it can not be shown upon a screen and thus be visible to an audience. Each stereograph must be viewed in the stereoscope by one person at a time.

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[Dr. Kells here made a clinical demonstration of making stereographs.]

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Mr. President and gentlemen, you have now seen the whole process of making dental stereographs upon films within the mouth, as practiced by me. You will note that, as compared to the taking of plain skiagraphs, the process is tedious and difficult, but bear in mind that when a case presents of which the plain skiagraph spells failure, and the stereograph means success, there can be no such words as "tedious" and "difficult;" the ends attained make the work a pleasure and the satisfaction of changing failure into success should allow the easy road to failure to be overrun with weeds, while the more difficult path to success is being beaten down to hardpan.

If what has been shown this evening has proved of interest to the members of this Society, I will have been amply repaid for the efforts made.

#### DISCUSSION

*Dr. R. Ottolengui, New York City.*—I wish to take this opportunity to discuss the terminology which Dr. Kells has used in his paper this evening. In the first place, I will begin with the roentgen part of it. Dr. Kells cited the fact that these pictures were first called skiagraphs and radiographs. Then he told us that when the American Society of Roentgenology was formed they coined a set of terms beginning with roentgen, and he claimed that this society had a right to do that. That will be my first dispute with him.

If any one should ask me what my chief occupations are, I should say that I am an amateur photographer, an amateur philologist, an amateur orthodontist, and a professional dentist; professional at least in the sense that I profess a good deal. (Laughter.)

I want to speak to you now from the two standpoints of an amateur philologist and an amateur photographer, and first as a philologist. I became a member of the

Section on Philology in the Brooklyn Institute long before Roentgen discovered the x-ray. Consequently, I may say that the rules for coining words existed long before Roentgen discovered the x-ray, and therefore long before the American Society of Roentgenology was organized. In the realm of science one scientific society has no right to break the rules previously and correctly established by another scientific society.

In philology which means a love of words, there are definite rules for making new words, and one of the most rigid of these rules is that in coining a word you can not combine from two languages, with few rare exceptions, where Latin and Greek may be used together, largely because in the Latin and Greek there are a number of words in common. But even this is undesirable and should be avoided if possible.

Another rule is that one must not coin a word out of a proper name. That, however, is largely a matter of taste more than a set rule. Philology tells us not to combine two languages to make one word and not to coin a word out of a proper name. Such a word as "Roentgenology" breaks both rules, because *logos* is from the Greek and Roentgen is a German word and a proper name. So much for roentgenology.

When Dr. Kells tells us that the Roentgen Society had the right to create all these Roentgen terms, I am forced to disagree with him. The Roentgen Society could with propriety honor Roentgen by dropping the term x-ray and calling it the "Roentgen ray," but there they should stop.

#### SKIAGRAPH

Let us now discuss this word "skiagraph." Dr. Kells tells us that "skiagraph" is from the Greek, means "shadow picture," and "these are shadow pictures and nothing else."

This word skiagraph, from "*skia*," shadow, and "*grapho*," to write, was in the dictionaries before the roentgen ray was discovered, and probably was originally coined for use in its astronomical sense, in which science it means to "determine the time of day by means of a shadow." Literally, to "write (the time) with a shadow." In the early days of the use of the roentgen ray it was used to mean these pictures taken with the roentgen ray, and for this reason I have no doubt that it can be found in dictionaries of today defined just as Dr. Kells has defined it. Nevertheless, I contend that the more recent term "radiograph" is a better term, for which reason "skiagraph" should fall into disuse.

Let us question Dr. Kells' statement for a moment. Is the picture under discussion a "shadow picture?" I think not.

A shadow is a darker area cast upon an illuminated surface by the interposition of an opaque body between that surface and the source of light. But more than that is to be considered. The quality of the surface upon which the shadow falls is a factor in producing the shadow. It must be an opaque surface. Shadows are not seen upon transparent surfaces. Is a photographic film opaque? If it were and if these pictures were "skiagraphs," shadow pictures, we could make only one at a time. Yet we know that we can make ten as easily as one.

A shadow is almost if not entirely of one shade. And, what is more important, the gradation of the shadow does not depend upon the so-called "density" of the object, but upon the distance between the object and the surface which records the shadow. Try a simple experiment. Hold a wooden ruler between an electric light and a white wall. Move the ruler slowly away from the light and toward the wall, and observe that the shadow increases in its intensity as it approaches the wall. Certainly, its molecular arrangement is not altered.

To be scientifically accurate, we could make the following differentiations: A photograph is produced by the action of light reflected from an object, through a lens, upon a sensitized plate. A radiograph is produced by the action of the roentgen ray passing through an object and affecting a sensitized plate. A skiagraph is produced by interposing an opaque body between the source of light and an illuminated opaque surface, which thus records the shadow cast.

Hence I would be willing to have Dr. Kells use the term skiagraph for a roentgen ray picture of a gold crown or other object composed of material which is radiopaque. But those pictures used by him to demonstrate his views on "lingual and buccal aspects" are true radiographs because the internal anatomy of the tooth is disclosed.

I hope that I have finally convinced Dr. Kells of the error he makes in adhering to this word "skiagraph," but I fear not, because I have frequently written several pages to Dr. Kells trying to convince him in certain matters, and in reply I usually have re-

ceived merely a sort of telegraphic form-letter reading: "Dear Otto,—You are wrong. Kells." (Laughter.)

*Dr. Kells, (closing.)*—I ought not be held responsible for the vagaries of mind and odd ideas in Rod's head. (Laughter.) It is not my fault if he writes four or five pages of argument and I find he is wrong. We are friends and always have been. Is it not a great deal better to write him back, "You are wrong," than to write four or five pages and argue with him and let him think he is right? He might misinterpret what I said. (Laughter.) If I had known that Dr. Ottolengui was going to criticize my terms, I would have skipped that part of the paper in reading it, because I frankly confess that I am not in it on an argument with Dr. Ottolengui on anything. I never saw another man who could take absolutely nothing, the worst end of an argument, and build up such a fine argument and make everybody believe that he is right except the fellow he is arguing with or against. (Laughter.) He may tell us all that he chooses, on nomenclature and philology, but, nevertheless, this time he is wrong.

A skiagraph is certainly not a photograph. It is a series of shadows.

It does seem to me that a society of orthodontists ought to be free to coin the words necessary in their literature which pertains to orthodontia.

When it comes to x-ray work, if there is a national society composed of men who do x-ray work, it seems to me it is within their province and it is their privilege (I may be wrong about this), to make a terminology for themselves. I do not believe that outsiders should do it.

I am sorry that the only thing that really interested you this evening has been terminology. I came nine hundred miles since yesterday morning to present this subject, which I thought would interest you, but it looks as though I am to be disappointed.

I threw on the screen this evening a double picture and I said, "Who is there here who would believe that these two pictures were one and the same tooth?" I did not intend to tell this, but I am going to do so because it may have some weight. That was the picture of a little girl eight or ten years of age, and that stereoscopic picture was taken eight or ten years ago. I was then regulating teeth. Her father brought her to me and wanted me to do the work. I took pictures and expected to do the work, and before I started the work he wanted me to guarantee to bring the tooth down. I said certainly not. I told him I would guarantee to do my best, but I would not guarantee to bring the tooth down. I did not get the work. He took the girl to a capable orthodontist who guaranteed to bring the tooth down. This man worked on her four years, and at the end of the fourth year the tooth was not in sight, and he went in and cut the tooth out. That patient is wearing an artificial substitute today. If that man had had stereographs of that case from time to time and worked with them, I believe he would have gotten that tooth down.

I showed another picture of the case of a little girl that was brought to me a few months ago. The tooth was nowhere where a plain skiagraph showed. I took a stereograph. I cut down upon the cusp, and that tooth will be brought down and in line.

I have had cases in my practice that would have been failures without the stereograph.

*Dr. Flint.*—By taking pictures at two different angles, can you locate a cuspid that is impacted?

*Dr. Kells.*—With a plain skiagraphic picture I do not say that it can not be done, but I know I can not do it. Take the case of which I showed two pictures; neither one of those pictures was worth a cent. I am referring to the little girl with the two upper laterals (Fig. 4). You could not make a diagnosis from a skiagraph because the roots overlapped. We could differentiate, however, with the stereograph. Just imagine a beautiful little girl, eight years of age! What a mistake it would have been to have extracted that permanent lateral, leaving in an inferior or constricted supernumerary tooth. She would have been marked for life.

No one can appreciate the importance of this work until he studies it, but if you examine a stereograph you are not looking at simple shadows. Take a stereograph of the skull and you will find it is wonderfully beautiful. You see the various bones clearly. You see the teeth floating, as it were, in a semi-transparent substance.

Lastly, I wish to thank you for the marked attention you have given to me in presenting this subject. (Applause.)

# **DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA**

Under Editorial Supervision of

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## **SOME PATHOLOGIC CONDITIONS OF THE MOUTH AND THEIR TREATMENT\***

BY CHALMERS J. LYONS, D.D.Sc., ANN ARBOR, MICHIGAN

THE subject of pathologic mouth conditions is one of tremendous proportions. It is one that has been given too little attention in the past, by the general practitioner. It is a lamentable fact that in the examination of the mouth, as made by the average dentist, the discovery of carious teeth is uppermost in the dentist's mind and his examination is completed when the tooth surfaces have been explored. The thought of making an examination of the mucous membrane, tongue, tonsils, pharynx, and salivary glands, is not usually considered. Blair<sup>1</sup> says "until the much desired cancer specific is discovered, it is mainly to the educated dentist grounded in general oral pathology, who makes a complete survey of the whole mouth that the medical profession and the public must look to reduce the now increasing death rate from cancer of the mouth."

The writer wishes to call to your attention some of the pathologic conditions of the mouth and their treatment and to emphasize the great responsibility that the educated dentist must assume in his respective community. Making a judicial dental diagnosis is not always a simple procedure and very often the skill and ingenuity of the operator is taxed to the utmost in working out the chain of evidence upon which he must base his decision. A clear understanding, by the dentist, of the value of symptoms of disease which he sees and of those described by the patient is of vital importance in making up this chain of evidence. One of the advantages of the dentist with long experience, over the younger men, is the ability of the older man to grasp the essential details of the condition at once. Much of this ability is gained by a gradual process through years of practice and observation. It is true that in recent years the x-ray has

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aided us materially in our diagnostic work of the mouth: yet, too many men in our profession are depending entirely upon the radiograph in making a diagnosis. While we concede that the radiograph is indispensable in dental practice today, yet it should form only one link in the whole chain of evidence in formulating the diagnosis.

The history of present and past illness, signs and symptoms are very important in determining the diagnosis. It has been the observation of the writer that the best diagnosticians, in both medicine and dentistry today, are those men who have been trained to objectively and subjectively differentiate the pathologic from the physiologic and use the x-ray only as a further means of arriving at a definite conclusion. Do not misinterpret the meaning here. The use of the x-ray must not be depreciated. Yet the plea which is made is that we must not overlook the fact that the radiograph is not the picture of the pathology, but only a record of the shadow of the tissues and the extent of the pathologic involvement which appears upon the film will depend largely upon the angle from which the radiograph was taken. This, you will readily agree, is not sufficiently definite to wholly rely upon in forming a judicious and conservative diagnosis.

#### PAIN

One of the most perplexing problems that confronts the general practitioner is obscure pain localized in the jaws. These pains are frequently referred from some lesion distant from the point of manifestation. Many times healthy teeth are sacrificed in the endeavor to eliminate the possible source of so-called neuralgia, when the source of irritation is remote from the seat of pain, but misinterpreted by the patient. Goldschider has put forth a theory that in the Gasserian ganglion there are certain nerve cells performing a dual role. These cells have either split fibres or two separate nerve fibres, one running in one division of the fifth nerve and the other in one of the other divisions of the same nerve; thus pain may be manifested in the region of an upper cuspid or incisor tooth when the source of irritation is in a lower molar. A short time ago the writer had a patient with pain in an upper cuspid tooth when the source of irritation was found to be in a paratonsillar abscess, or on a branch of the lingual nerve and referred to the upper cuspid on a branch of the maxillary nerve. It is not an uncommon occurrence to find referred pain from impacted or unerupted third molars. How frequently do we find headaches relieved after the removal of impacted teeth? The practical lesson to be derived from this is that the dentist should be on his guard against a number of sources of error in diagnosis of pain and that these cases demand of the dentist a most thorough knowledge of the anatomy of the field in which he labors. A slight derangement of nervous function may produce the most unexpected consequences in the most unexpected places. With our present methods of nerve blocking, if the source of irritation is in either the second or third divisions of the fifth nerve, a definite diagnosis can usually be made by blocking off a section of each branch at a time and observing the results. In cases of severe tic douloureux often the teeth are needlessly sacrificed by the dentist in the endeavor to give the patient relief. This practice is so common that a large majority of the patients seen in the hospitals of the University of Michigan, who have suffered with tic for any length of time, have

edentulous jaws. Our knowledge of dental and oral pathology should be of such a high order that teeth should not be sacrificed unless we are reasonably sure that the patient is going to be benefited.

Hutchinson<sup>2</sup> says: "The extraction of teeth with a view of relieving or curing true epileptiform neuralgia or tic douloureux is a pernicious and useless practice." There exists no valid evidence to regard trigeminal neuralgia as a spreading neuritis of dental origin. It is contended by many able brain surgeons that the etiology of tic douloureux is of central origin and the removal of the teeth would in no way be of any assistance in the relief to the patient. Our experience in the past has been that injections of alcohol or even neurectomy for tic douloureux is of little more value than extraction of the teeth in offering permanent relief. It is the writer's opinion that operation on the ganglion itself, though attended with all of its dangerous sequelæ, is the only means of permanently relieving the patient.

Another type of referred pain in the inferior maxilla that is often perplexing to the general practitioner is that arising from an old syphilitic lesion. This is a referred pain from syphilis of the heart or aorta and is probably referred through the sympathetic system. It is not an uncommon condition and must be taken into consideration in running down these obscure pains. Such conditions improve under antisyphilitic treatment. In the opinion of the writer, syphilis is a greater curse to mankind than tuberculosis. There is probably no disease that is as insidious in its progress with as far reaching effects as this disease. At the present time our one bright hope in the control of this disease is in the army and in the segregation of those afflicted. Syphilis is due to the infection with *Spirochæta pallida* and is only transmitted by contact. Consequently, it can only be controlled by segregation. A favorite site for the primary lesion or hard chancre is on the lip; it is also frequently found situated on the tonsils. The primary lesion is seldom found on the cheek or tongue. In its incipient stage it appears as a crack in the lip or an abrasion surrounded by a thickening of the tissues, which is later destroyed by ulceration. This can be differentiated from certain forms of stomatitis in that the chancre is painless and usually causes enlargement of the lymph nodes.

Secondary syphilitic manifestations of the mouth are usually of an erythematous or ulcerative type, commonly seen on the oral pharynx as an inflammatory area, attended by little or no pain. The mucous patch may be observed on the edge and tip of the tongue, and on the dorsum of the tongue, uvula and fauces. These mucous patches are frequently found on the inner surface of the lips. They appear as large or small, either round or irregular plaques of a grayish white color, covered by a sticky secretion. These can be differentiated from the plaques of leucoplakia buccalis in that those from the latter can be traced as arising from a local irritation. Secondary manifestations of syphilis in the mouth may be differentiated from certain forms of stomatitis, Vincent's agina or other acute mouth lesions, for the syphilitic lesions are not accompanied by pain.

Tertiary syphilitic manifestations are frequently seen in the mouth as gummatous ulcers. These may be mistaken for carcinomata if on the cheek or tongue. On the tongue they will usually appear over the whole upper surface, while carcinomata would be confined only on the edge and involve only one side

of the tongue. Carcinoma of the mouth is frequently the site of an old syphilitic lesion. Jonathan Hutchins, Jr., informs us that in thirty per cent of patients suffering from epithelioma of the tongue a history of former syphilis can be obtained; twenty per cent of the epitheliomata of the tongue have their site on syphilitic inflammation. Diagnosis of syphilis from mouth lesions is not a simple matter. The history of the patient is usually not reliable, for in the large majority of patients the knowledge of the presence of venereal disease is denied. The Wassermann test is the most reliable one at our disposal today. While all syphilitics will not give a positive reaction, yet it is very rare that a positive reaction can not be obtained in the presence of active syphilis.

What is the dentist's responsibility in regard to syphilis? When this disease is so prevalent today; when its sequelae are so far reaching; when it is so easily transmitted to others, is it sufficient for us when examining mouths of patients to simply look for carious teeth? There can be but one answer to this question. A few weeks ago a bright, fine looking young lady of fifteen presented herself for mouth examination. When she opened her mouth the writer was amazed to find that the whole palatal vault was missing, together with central, cuspid, bicuspid and one molar tooth on each side. The condition was at once recognized as syphilis. In so healthy appearing an individual the presence of congenital syphilis was dismissed. In obtaining the history, this syphilitic condition was found to have been induced by vaccination about four years previously. The only answer for the presence of this condition is that unclean instruments were used at the time of vaccination. This same unfortunate result might easily occur from unclean dental instruments after operating upon a syphilitic patient. Today you say we all sterilize our instruments. Yes, but how about the hands? Do we use rubber gloves in these suspected cases, and how about those patients whom we operate upon that do not excite our slightest suspicion? Yet if a blood test was made some of them would show a positive reaction.

The point the writer wishes to leave with you is that more careful survey of the mouth should be made on every patient and if a suspected lesion is discovered follow it up until it is identified. In the more suspicious cases refuse to do anything until a Wassermann test is made. It is now a matter of routine in many of the best hospitals of this country for a blood test to be made of every patient who enters. It is only by the strictest vigilance on the part of the practitioners in all branches of medicine that this disease may not get beyond our control. Will dentistry do its part?

#### MALIGNANT DISEASES OF THE MOUTH

When we consider the invariable outcome of a malignant tumor of the mouth, when not treated, with its attendant horrors, not only to the victim, but also to his family; when we consider the improbability of successfully treating these cases in the advanced stages, then we can clearly conceive the advantages and importance of making an early diagnosis. The dentist usually sees these precancerous conditions long before the surgeon, because the average patient does not present himself to the physician until physical discomfort compels him to seek aid. At this time the disease has progressed to such a stage that makes the

condition inoperable, or at least the probability of successful treatment is greatly reduced. The dentist has the opportunity of observing these mouth conditions in the early stages, and Blair places the responsibility of early diagnosis upon our profession in his well delineated statement expressed in the beginning of this paper. The writer believes it to be the moral duty of every dentist, not only to examine the teeth of his patients, but to make a thorough examination of the mouth, lips, tongue, pharynx, and tonsils.

Any rough surfaces on the teeth which are producing a constant irritation should be removed. In cases of small chronic ulcers or sores in the mouth a complete history of the case should be obtained. If the history should lead to the assumption of former syphilitic affections then it should be looked upon with grave suspicion. One of these precancerous conditions with which the dentist will come in contact is leucoplakia. This is invariably caused by excessive use of tobacco. It is characterized by the formation of white patches on the mucous membrane of the tongue and may spread to the cheek. In tobacco chewers an outline of the quid of tobacco in a white patch is sometimes observed on the buccal mucous membrane of the gums and cheek in the vestibule of the mouth. Leucoplakia is an idiopathic disease, insidious in its progress, which begins with an opaque or white spot. The most common site is the dorsum of the tongue. These spots may ulcerate and coalesce into larger ones. In their incipency these cause little or no inconvenience and if discovered at this stage, usually the removal of the cause will eradicate the disease. As their growth progresses they become painful and the tongue, lips, or cheeks, as the site may be, become indurated and slight hemorrhages may occur. At this stage we invariably have beginning carcinomatous degeneration.

The similarity between leucoplakia and secondary syphilis is often confusing. The syphilitic plaques usually appear on the border and back of the tongue and at the same time other patches may be observed on the gingiva, palate or tonsils. The syphilitic spots are soft, while those of leucoplakia are hard. In the diagnosis of precancerous conditions of the mouth we must ever keep in mind that any constantly continued irritation may predispose to malignancy. We must ever keep in mind that there is no part of the body that is so subjected to continual traumatism as are the mouth, lips, and tongue. We must not forget the fact that a large number of patients seeking dental services beyond the age of forty-five present mouths with teeth that are broken down with sharp edges or the surfaces abraded through the process of mastication, leaving knifelike edge surfaces which may abrade the soft tissues, giving rise to a chronic ulcer which may ultimately lead to malignant disease. Many of the precancerous conditions can only be correctly diagnosed by microscopical examination. It is clearly the duty of the dentist when a lesion is present in the mouth that can not be diagnosed as ordinary dental diseases to direct the patient's attention to it and, if possible, have a microscopical examination made. In obtaining a section always obtain normal as well as pathologic tissue in the section.

#### DENTIGEROUS CYSTS

This condition is frequently mistaken for a tumor or an alveolar abscess. It is frequently seen in mouths of men and women under thirty years of age. It usually takes the form of a cystic growth connected with teeth or tooth follicles



when eruption is retarded. In the light of our present knowledge the explanation for the formation of these cysts is largely theoretical. Thomas has given what seems, to the writer, the most plausible theory. He states that when the development of the enamel of the tooth is completed its outer surface becomes perfectly detached from the investing soft tissue and a small quantity of transparent fluid not uncommonly collects in the interval so formed. This fluid is ordinarily discharged when the tooth is erupted, but when from some cause the eruption is prevented it increases in quantity and gradually distends the surrounding tissues, causing a resorption and disintegration of the adjacent osseous structures. The cyst may go on developing until a large portion of the jaw is involved.

It may be differentiated from an osteoma, in that with the cyst, fluctuation and crepitation can usually be elicited. It may be differentiated from an alveolar abscess from the fact that the cyst is very slow in its formation and is not accompanied by pain. Sometimes a history of several months in its formation will be obtained. The absence of any of the permanent teeth with the associated lesion suggests the possibility of a cyst. An amber colored fluid may be aspirated from the cyst by means of the ordinary hypodermic syringe in completing the diagnosis. The x-ray will show a definite cavity with a limiting membranous lining. The method of eradication consists of widely opening the cyst, removing the unerupted tooth or tooth follicles, removing entirely the cystic lining and treating the same as any other wound in the mouth of the same extent. It has been the writer's experience that packing the cavity with iodoform gauze and irrigating with five per cent salt solution every twenty-four hours will yield good results. The most serious sequela of a dentigerous cyst is the absorption of the bone against which the cyst exerts pressure. A large portion of the maxilla or mandible may be destroyed by pressure resorption resulting therefrom.

Epulis occurs most frequently in childhood and in young adults. In a series of 167 cases Scudder reports forty-nine of them were in men and 118 in women. Thus it would seem that women are more susceptible to these mouth tumors than men. The irritation from a carious tooth may start an epulis, or a tooth root may serve as an irritation which will encourage its development. Calcareous deposits on the teeth may also be looked upon as a possible etiologic factor. Bloodgood states that epulis stands between the really benign, slightly malignant, and the malignant connective tissue tumors. There are two varieties of epulis—the fibrous epulis and the giant cell epulis, the giant cell epulis being the more common. The fibrous epulis is ordinarily of small size, projecting between two teeth and spreading somewhat over the alveolar border. This type may become calcified extensively or in limited areas throughout its substance. The fibrous epulis is smooth and quite firm on the surface, not very vascular and does not bleed very easily, while the giant cell epulis is soft and irregular and contains many vessels and bleeds easily when disturbed.

This growth is slow at first, but becomes rapid as it progresses and many times will cause the teeth to spread apart with consequent loosening. As these tumors enlarge they may remain attached to a small stalk. At first these tumors are benign, but later may become malignant. The importance of early treatment can not be overestimated. They should be removed as soon as identified and sub-

jected to a careful microscopic examination. The portion of the periosteum or alveolar process to which they are attached should also be removed. This may necessitate the removal of one or several teeth in order to remove the tumor in its entirety, and unless it is completely eradicated the effort to obtain a cure will be fruitless.

There is a greater tendency to do an insufficient amount of cutting than there is to perform an operation that is too radical. After the complete removal of the tumor and its source the actual cautery should be used to sere over the wound. Another very important and not infrequent pathologic condition of the mouth which is of vital interest to the dentist is Vincent's angina. The lesions are associated with a mixed invasion of fusiform bacilli and *Spirochetes Vincenti*. The fusiform bacillus was first described by Miller in 1883, who found that the infection occurred in clean as well as in unclean mouths. During the decade following 1896 Vincent, a physician in Paris, wrote extensively on both the organism and the clinical findings. He gave the disease the name of Vincent's angina. It is defined as an infectious disease of the mucous membrane of the mouth, throat, and bronchi. This disease, or one simulating it, is prevalent among the troops of the armies of Europe and is referred to as "trench mouth" or "trench gums." The disease probably has no connection with trench life excepting the conditions made possible by the collecting together of large numbers of young men. The one condition which favors the development of the disease is oral sepsis. Vincent's angina is a very infectious disease and when it makes its appearance in the army it soon becomes an epidemic. The disease is characterized by a deep tissue necrosis, covered by a whitish gray membrane. This membrane is easily removed and when rubbed off leaves a granular, raw, bleeding base. This leads to craterlike ulcers with irregular edges.

Barker and Miller<sup>3</sup> classify the symptoms as follows: Objective signs,—insignificant constitutional disturbances, as a rule the patient is not very ill; absence of fever, the temperature rarely rising over from 100 to 101 degrees; heavy and offensive breath; enlargement of the cervical and submaxillary glands, moderate as a rule; they are tender and never suppurate; the lesion itself; and swollen, spongy, and bleeding gums, suggestive of scurvy.

Subjective symptoms:—The patient complains of extremely bad taste in the mouth; tenderness of the gums, so that the use of a tooth brush is impossible and mastication is so painful as to preclude eating; pain in swallowing; looseness of the teeth, with salivation, which is common, resembling mercurial ptyalism; anorexia, or loss of appetite; painful joints; lassitude—"lack of go;" and the most serious constitutional symptom, and one always present when the teeth and gums are affected, is severe depression.

The prognosis is usually favorable. Most cases run a benign course. If seen early the case can be controlled easily. Internal medication has little or no value. The care of the mouth is the first essential step in prosecuting the treatment. A solution of one-half of one per cent potassium permanganate used as a mouth wash every three hours will yield good results. The application of seven per cent tincture of iodine to the pockets around the teeth and touching the ulcers with silver nitrate (concentrated solution) is recommended. Emrys-Roberts<sup>4</sup> recommends a lotion of hydrogen peroxide, five fluid ounces; wine of

ipecac, three drams; glycerine, five drams, and water sufficient to make eight ounces. Local applications of arsphenamine in concentrated solutions or dusted over the surfaces are regarded as one of the best therapeutic measures obtainable. The mouth and teeth should be made as clean as conditions will permit before resorting to local treatment.

#### DISEASE OF THE ANTRUM OF HIGHMORE

What is the dentist's responsibility relative to the treatment of these cases? The writer believes that greater good and more satisfactory results can be obtained by cooperation of the rhinologist and the dentist in these cases. It is a matter of making a correct diagnosis. When the disease is of purely dental origin then the responsibility should fall upon the dentist to handle the case. If the accessory sinuses are the etiologic factors in producing the disturbance then the responsibility must rest upon the rhinologist. There are just three principles that we must keep in mind in the treatment of empyema of the antrum:

First remove the source of irritation, then drainage must be established, and finally ventilation must be maintained. In other words, treat it as any other abscess in the body is treated, with the addition of maintaining ventilation.

The writer wishes again to emphasize the importance of making a correct diagnosis. This is more important than the character of the operation. It is not of so much importance as to whether drainage is established through the nasal or oral cavities as it is that the source of irritation be removed. Too often dentists open into the antrum in the attempt to effect a cure when the source of irritation is in the frontal or sphenoidal sinuses or ethmoidal cells. In these cases only two of the three principles are carried out, viz., drainage has been established and perhaps ventilation maintained, but the antrum still discharges because the source of the trouble is still present. It is such cases that have led to the criticism of the Caldwell-Luc operation, or opening the antrum through the canine fossa. A criticism that is frequently made is that the opening will not close. Of course, it will not close if pus is continually discharging through it. If the source of irritation is removed, it has been the writer's experience, and in this he is sustained by many others, that it is difficult to keep the antrum open long enough to treat it. This whole proposition can be reversed if the source of irritation is of dental origin, then opening through the nasal fossa will not avail a cure. It merely establishes a drainage. Again, the method of operating is of secondary importance.

In cases of empyema of the antrum, when the source of irritation is of dental origin, the writer prefers opening into the antrum through the canine fossa, making the opening large enough to explore the antrum with the forefinger, thus septi may be discovered and cut away if necessary. The antrum is then irrigated with a five per cent salt solution and packed with iodoform gauze for twenty-four hours. The gauze is then removed and not replaced, but a gutta percha button is fitted to the opening to keep out food debris, etc. The antrum is then irrigated every twenty-four hours for three or four days; then the irrigations are made less frequent. The gutta percha button is cut down each time of treatment until it is reduced to five mm. in diameter, when it is left out entirely and complete repair takes place.

We shall now consider briefly a phase of one of the most common pathologic conditions found in the mouth, viz., those morbid conditions involving the pericemental membrane. The writings on the subject of mouth infection have been voluminous during the past five years, and in this discussion we shall confine our thoughts to the eradication of those infections found at the ends of the roots of the teeth.

Dental and medical science<sup>3</sup> have made it clear that pathologic conditions of the pericemental membrane and diseased ends of the roots of the teeth are a contributing factor to, and frequently the primary cause of, general systemic disturbances. The physician and the laity are looking to the dentist to eradicate these conditions. This can be done by the extraction of the teeth followed by curettage and by surgical interference at the focus of infection, mechanically removing the morbid condition, leaving the healthy tissues to go on functioning.

It is a well known fact that with our present methods of root canal therapy, few of these morbid conditions can be so corrected that we can conscientiously assume that the area is free from infection, and will remain so. By what steps then are we to decide whether extraction of the tooth is indicated or whether the greatest service to the patient can be rendered by root resection? No hard and fast lines can be drawn as to just when root resection is indicated and when extraction of the tooth should be the operation of choice. Here again we come to the great question mentioned in the first part of this paper, viz., diagnosis. A correct diagnosis of each case is not a simple matter. The first question to determine is: Are general conditions favorable to normal repair of bone? To determine the answer to this question, there are several vital factors that must be taken into consideration. First, the present state of health of the patient; second, the past illness, and the possible recuperative or reserve force of the patient. The lowering of the vitality through chronic alcoholism or such diseases as tuberculosis, syphilis and diabetes which lead to a state of constitutional dyscrasia will have a profound influence in preventing repair, and redevelopment of normal tissue.

Age is another factor which should be considered. In the aged, the process of repair is slow and the prognosis for home regeneration is not so good as that in the young or in middle life. In the aged the operation of root resection is not undertaken without considerable hazard. The condition of the circulation of the blood is still another factor that plays a very important role in making up a judicial diagnosis. It is an established surgical fact that without a certain definite blood supply to a part, repair of tissue will not take place. Notwithstanding the fact that the teeth and surrounding structures have a very rich blood supply, in certain types of individuals, and under certain pathologic disturbances, there is not sufficient blood supply to the apical area to insure repair of the parts after the operation of root resection. The clever diagnostician will discover this condition before making his final decision as to the character of his operation.

#### THE X-RAY IN DETERMINING THE OPERATION INDICATED

The proper evaluation of x-ray findings is very important to correct diagnosis. If the case is one of an alveolar abscess of long standing, or a case of imperfectly filled root canal with granuloma showing in the apical area where all

of the evidence points to disease and death of the pericemental membrane in the apical areas, it is the opinion of the writer that surgical procedure rather than dental therapy is indicated. The character of the surgical procedure may be root resection in favorable cases and extraction of the tooth in the unfavorable ones. It is a lamentable fact that many men are resorting to root resection as a short cut method for curing an alveolar abscess over a beautiful crown or bridge attachment without first removing the same and sterilizing and filling the root canals. If the canals and dental tubules are not previously sterilized and the canals thoroughly filled, a reinfection will occur from the tubuli exposed when the resection is made.

It is not permissible to leave a crown on an imperfect foundation because it is a masterpiece of art. If it is not worth while to remove it and sterilize the canal and tubuli then it should be extracted. Too often, root resection is resorted to for the purpose of saving a nice piece of bridgework, and the patient's health is jeopardized. We are not doing good surgery when, as a matter of routine, we do not insist that the canals be sterilized and filled just previous to the operation.

The question of sterilizing and completely filling canals in multirooted teeth for the eradication of an infection, is a very doubtful procedure and in the writer's opinion the patient's welfare will be better taken care of by extraction followed by curettage of the bone. In no cases should this operation be resorted to when the bone and pericemental membrane are diseased beyond the apical third of the root.

The technic for the operation of root resection will vary with the individual operator. The welfare of the patient should be the first consideration; a hasty diagnosis will often lead to failure, and the patient will consequently suffer from the operator's misconception of conditions.

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### SURGICAL LESIONS OF THE ORAL CAVITY\*

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**I**N presenting this article, I have not gone into what constitutes the oral cavity or the associated parts or the pathologic, microscopic or bacteriologic condition in lesion of the oral cavity, but have endeavored to condense and make it as brief as possible.

A very serious condition confronts the oral surgeon today in this World's War, in the numberless wounds to the oral cavity from the explosion of the hand

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grenade, a blow from the gun stock, sabre stroke, thrust of a bayonet, bursting shrapnel, the cannon ball or any of the terrible implements of warfare.

The first consideration will be wounds of the oral cavity. Most of these wounds may involve all of the soft and hard parts of the oral cavity, with invasion of all kinds of infection of bacteria and bacillus.

Wounds are classified as open and closed wounds: open as from knives, sharp instruments, stroke of sabre, thrust of bayonet, bursting of shrapnel, bullets and cannon ball; closed as from contusion, a blow of the butt end of a gun stock, which sometimes results in fractures. From a clinical standpoint, open wounds are classified first, as incised or clean cut wounds made with sharp instruments; second, punctures with pointed instruments, a thrust from a bayonet, torn or lacerated, either by bullets or some projectile, the condition of the wounds depending upon the velocity and kind of projectile.

Closed wounds are classified as such when the soft parts and periosteum are involved as from a blow causing contusion, or from burns, destroying tissue either by heat, cold, light, electricity, gases or caustics. Wounds may be considered under one general head as aseptic—free from infection, septic—infected by some microorganism or bacteria and bacilli; the bacteria such as streptococci, staphylococci, pneumococci and gonococci; bacilli as anthrax, glanders, spirocheta or syphilis, actinomycosis or lump jaw, from the ray fungus. Poisons as ptomaine from putrid meats; toxins as tetanus and diphtheria. The bacteria may be pathogenic and nonpathogenic and accompanied with hyperemia, edema, swelling, pyrexia and prevalence of leucocytes which might produce leucocytosis. Wounds may be divided again into superficial, deep, simple and complex, as from foreign bodies, with serious infection, hemorrhage, injuries to the blood vessels, nerves, bones and other parts. Most injuries of the superior maxillæ and mandible are apt to involve the soft structure causing cellulitis, lymphangitis, caries followed by necrosis and sometimes infection of tetanus and anaerobic bacillus.

During the Spanish-American War in the South, they had several cases of caries and necrosis from the administration of calomel. Treatment for tetanus the tetanus antitoxin given hypodermically; actinomycosis is surgical and the x-ray; syphilis is the mercurial, iodii potassium and salvarsan, and in case of perforation of the soft and hard palate when the syphilis is cured, do a mucoperiosteum operation filling in the lost parts as in a cleft palate operation. If any of these conditions exist, which they always do, the patient will have a temperature and in most cases shock. In all injuries if hemorrhage is present, one must first of all control it. Then clean the wound of all foreign substances with a normal saline solution, "Dakin's solution," chlorazene solution or permanganate potassium solution; second, by compression of the carotid artery or by picking up the vessels with a hemostatic forceps, tying a ligature around the artery, or if the artery is separated, by suturing, by Criles' method. In regard to closing the wound one must first have coaptation of wounded surfaces which will promote healing by first intention if all infection has been cleaned up; if an infection, one must put in a septic condition using drainage, and the best is Sigret or the gauze tape either one inch or one-half inch, with a solution of soluble iodine or iodoform gauze tape; then place over that several thicknesses of dry gauze using ad-

hesive tape to secure it and retain it in position, changing the dressing every day or so, irrigating with the solution above mentioned. Administer internally, soluble iodine 3 gtt.—doses 3 times a day before meals, increasing it 1 gtt. a dose a day until at least 20 or 30 gtt. is reached; of potassium iodii or specific medicine Echinacea "Lloyd's" Z doses in water 2 oz. every 2 hours. Give sodium sulphate for the bowels, or in fact, always see to the elimination of the kidneys and bowels. One thing I never use is peroxide of hydrogen, as it not only irritates the wound and prevents healing, but carries infection to other parts.

In case of shock administer, first of all,  $\frac{1}{4}$  gr. of morphine or H. M. C. hypodermically, afterwards stimulants and heat to the body, stimulants such as strychnine 1-60 to 1-30 hypodermically; put the patient to rest in a warm bed in a warm room, hot water bottles to the body. In case of nervousness such sedatives as any of the bromides or specific med. gelsemium x to xx gtt. in water 4 oz., then give 1 dr. every two hours or oftener if needed. If very much involvement of the tissue with pus, use the lance quite freely and above all do not forget to establish drainage afterwards. In case of postoperative hemorrhage use coagulose, surgical pituitrin, horse serum or adrenalinchloride 1-1000 hypodermically. In case of caries or necrosis, curet, establish drainage, swab with aromatic sulphuric acid, irrigate with Dakin's solution or permanganate of potassium, pack with soluble iodine or iodoform gauze tape until normal condition is established. In case of infection of actinomycosis, remove all of the decayed teeth or roots, clean the mouth, curet, irrigate with permanganate of potassium solution, establish drainage, pack with soluble iodine, use x-ray treatment, administer potassium iodii. In case of syphilitic lesions, remove the necrosed bone, use soluble iodine, put patient on systemic treatment, either mercury, potassium iodii, or salvarsan.

In regard to fractures of the oral cavity during the World War, one will find from a simple to a complicated fracture, but I would think there would be more of comminuted and compound as a result of the blow of a gun stock, gunshot or bursting shrapnel causing contusion, splintering of the bone with serious laceration of the tissue, tearing the nerves in two, and severing them, and displacement of the bony structure accompanied by shock, hemorrhage and more or less infection followed by inflammation; swelling of the tissue and likely pus and caries and necrosis with lack of function to the parts. In repairing these injuries, first attend to shock if present; second, clean the injury and remove all foreign substance; third, stop hemorrhage; fourth, bring the fractured parts together by thorough coaptation either by splints or wiring the teeth together, having proper occlusion of the teeth, or surgically wiring through the fracture, using silver wire about 26 gauge, or by bone core, bringing the soft parts together by suturing, using drainage, covering the parts with aseptic gauze, using different bandages such as four tail, Garrison or Barton, keeping the parts mobilized from four to six weeks, as it takes about that long to form a cast or union of the bone. See that the mouth is kept as nearly aseptic as possible. In most cases to reduce a fracture, a general anesthetic should be used, but if conductive can be used, do so; but as a general anesthetic nitrous oxide and oxygen with ether sequence, by nasal or intratracheal, or if you are on the field, ethyl chloride followed by ether as it is. Sometimes from necrosis and lack of circula-

tion, we have cases of ununited fractures which are apt to occur in compound comminuted fractures; open up and use transplantation of bone or bone core, which should be taken from tibia or the tibial crest, filling in and preventing resection of the jaw; the regeneration of the cells will take from two to three months.

The crest of the tibia is the best to use in the transplantation, using motor saw and chisel, handling the core as little as possible with the hands, suturing the core with kangaroo tendon to retain it in place, and in a short time or by the time of union, it will be absorbed. Then close the wound without drainage, and a well-fitted plaster can be applied if there is no infection. The success in treatment of all lesions of the oral cavity depends on the asepsis, or one will have failures.

The sutures are the aseptic silk, linen, ligatures, formalized pyoktanin catgut, size from No. 1 to No. 00, kangaroo tendon, 20 day catgut No. 1 to No. 3, and horse hair for stitching the skin as it leaves very little scarring.

In case anesthesia can not be produced by inhalation, or conductive, then you will use ether per rectum, which must always be used only in a hospital. Put the patient at rest, administer tonic. In regard to feeding, liquid diet either by nasal tubes, back of the third molar or per rectum. In all lesions of the oral cavity you will have more or less infection and the oral cavity should be as surgically clean as possible, as well as all of the instruments that are used.

#### ANKYLOSIS OF THE TEMPOROMAXILLARY ARTICULATION

This condition may exist from a fracture of the lower jaw or an injury to it and from being immobilized for so long a time, or from infection from typhoid fever where an excess of calomel being administered causes cancrum oris. Now this ankylosis may be temporary, permanent, incomplete, false, or complete bony, fibrous and osseous. It may be unilateral and bilateral. The treatment is to apply a wooden screw, a wedge by dilation with a gag. This dilation should be done every day, using the dilator on the occlusal surface of the teeth. I had a dilator made which will separate the jaws. After separating, put between the teeth a wedge of wood or compressed cotton which will swell from the moisture. Have the patient use a rubber cork between the teeth each day or operate upon the joint, using the Murphy operation.

Unerupted or impacted teeth in adult life and especially the lower third molars and the upper third molars, cause one of our serious lesions of the oral cavity. Some of the predisposing causes: first, defective embryonic development, malnutrition, syphilis, neurotic tendency, eruptive fevers, anemia, artificial feeding, idiocism. The exciting causes: first, arrested maxillary development, undue thickening and resistance of the overlying tissue, undue stimulation of the inferior dental nerve by pathologic conditions producing nutritional changes that intensify the bone in the region of the impacted tooth, malposition due to contracted dental arches, severe traumatism to the jaws causing disposition of lime salts in the cancellous tissue, too early loss or extraction of deciduous teeth, inflammation of the jaw bone set up by decayed teeth, local increase in the density of the bone brought about by inflammation of the periodontal membrane extending into the alveolar process. The cancellous tissue, instead of remaining



spongy and elastic, becomes hard and solid. This condition following caries of the first permanent molar soon after its eruption is frequent cause of impaction of the lower third molar.

#### SYMPTOMS

Impacted teeth may be present without giving any local or systemic symptoms, such as the appearance of the cuspids and third molars in adult cases, or unerupted supernumerary teeth, causes reflex pain, facial spasms, chorea, epilepsy, melancholy, mania, paralysis, sensory alterations, neuralgic or trophic changes, paroxysmal pains, insomnia, chills, thrills and flushes and muscular twitching, sweating, melancholy, fever or irregular pulse, pain across the frontal, temporal and parietal bones, pains in one ear or both and pains in the eyes, temporomaxillary articulation, ankylosis of the temporomaxillary articulation both permanent and temporary, pain in the shoulders and knees. Now some of your local symptoms such as swelling and inflammation of the gums around the teeth, and you may have separation, cellulitis, muscular contractions, tonsillitis, infection of the eye or iritis, infection of the lymphatic glands, caries and necrosis of the jaws, tumors benign and malignant (cancer has been caused from them), infection of the inferior dental nerve. Impaction may set up functional, nervous, and mental disorders, paralysis of the arms, spasms of the sternomastoid muscle, commonly called wryneck, deafness, neurasthenia and mania, infection of the tissue causing toxic neuritis, arthritis, endocarditis, nephritis, sepsis, gastritis, anemia, toxemia and septicemia.

#### DIAGNOSIS

Pain, swelling, redness, heat and impaired function of the jaw. The x-ray renders the impaction positive, certain and exact.

In removing, thorough cleansing of the mouth and tissue, paint the field with tincture of iodine using conductive anesthesia when possible. Instruments consist of mouth gag, cheek retractors, tongue depressor, small retractors, hemostatic small, straight and curved, tenaculums, one large hemostatic forceps, several curved needles, ligatures, needle holder (Brophy's preferred), mouth mirror, cotton pliers, one or two curets, bone cutting burrs, curved bistoury, several periosteal elevators, extracting forceps, excising bone chisels and mallet, mouth swabs, curved gum scissors. Some of the dangers of removing impacted teeth—inspiration of blood, pneumonia, hemorrhage, fractures of the jaw, dislocation of the jaw, general infection, failure to secure the tooth through the patient swallowing it. This can be avoided by packing with long sponges having your long hemostat at hand. These teeth should be removed surgically and the mouth kept in a septic condition, patient at rest, liquid diet, elimination of the kidneys and the bowels, administration of tonics, and in nervous conditions, sedatives. Avoid all hot packs to the jaws. These teeth should never be removed by the ordinary dentist or general practitioner, but by an oral surgeon or exodontist.

I will not go into the condition of the maxillary sinuses or infections of the oral cavity as leucoplakia, Vincent's agina, as no doubt at this meeting those subjects have been duly discussed.

# **ABSTRACT OF CURRENT LITERATURE**

**Covering Such Subjects as**

**ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY**

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

## **ORTHODONTIA**

**Value of Orthodontic Treatment.** Oren A. Oliver. *The Dental Summary*, xxxix, No. 1, 1919, p. 66.

Summing up a few of the benefits of orthodontic treatment, which are as numerous as the varied causes of malocclusion, the author enumerates normal occlusion, normal breathing, proper mastication, normal facial outlines, improved digestion and prevention of pyorrhea and caries. These far-reaching results make it necessary to impress upon our patients that the greatest value of orthodontic treatment lies not in the esthetic side, but is derived from the benefits which occur when the teeth are placed in normal occlusion, thereby eliminating many dental and systemic ills augmented or caused by malocclusion. With special reference to the most suitable age for the correction of malocclusion, the author states that the younger the patient, the better and easier the correction. By early correction of these cases marked facial deformities can be overcome. The length of time required for the treatment depends upon the class and type of the individual case. The average time for the completion of a case is from one to three years. Provided that all orthodontic treatment has been completed by the time the permanent teeth which replace the deciduous teeth are in full eruption orthodontia becomes an aiding process and the final result is the best that can be obtained.

**Alveolitis Dentalis. Interstitial Gingivitis, So-called Pyorrhea Alveolaris, Localized Catarrhal Stomatitis. Suggestions as to Its Cause and Its Treatment.** J. J. McNulty. *The Boston Medical and Surgical Journal*, clxxx 180, No. 8, 1919, p. 177.

The author points out that alveolitis dentalis or interstitial gingivitis is an error of metabolism manifesting itself essentially in and about the dental alveolus. The disease develops on a nutritional basis, and its treatment should accordingly be systemic, combined with surgical procedures as indicated. Insufficiency of the internal secretions and enzymes being ultimately responsible

for the condition, the scientific logical and effective treatment is the administration of properly associated internal secretions and enzymes. Diet is an essential factor in the treatment of alveolitis dentalis, and whole cereal food which is rich in vitamins and saline nutrients should be supplied to these patients. It is desirable that all proximate salts essential to health should be furnished through proper food. The digestion and conversion of the food into available nutriment is advantageously assisted by the administration of properly combined digestive ferments with meals. Orthodontic care is an important and essential part of the treatment of alveolitis dentalis, a condition which calls for the efficient cooperation of physician and dentist.

## **ORAL SURGERY**

**Closure of the Palatine Gap after Resection of the Upper Jaw.** H. Morestin. *Bulletin et Memoires de la Societe de Chirurgie de Paris*, xliv, No. 20, 1918, p. 1002.

Following the resection of the upper jaw for malignant tumor, the communication between the mouth and the nasal fossæ constitutes a most distressing infirmity which no apparatus can satisfactorily relieve. Endeavors are therefore in order to close this gap either immediately after the resection of the maxilla, or later on. Immediate restoration is evidently the most satisfactory solution, whenever it is practicable, as is often the case. When the palatine mucosa has not been invaded by the new growth, there is no reason for sacrificing it together with the bony framework. It is preferable to detach the mucosa, after having outlined a curved incision, at the outer portion of the palatine vault, as in the uveoplasty incision, and to keep this membrane in reserve, to suture it to the buccal mucosa, after avulsion or partial resection of the maxilla. Even in case this mucosa has to be removed up to one-half of the vault, there is nothing to prevent the buccal mucosa being detached, liberated, drawn inwards and sutured to the palatine gap. This procedure, of course, presupposes that it has been possible to preserve the cheek entirely or nearly so; that the hemostasis is satisfactory, and that the wound-cavity does not require direct supervision. However, very numerous cases remain in which this immediate reunion should be tried, and the author contributes three personal observations.

As a rule, however, palatine gaps resulting from resection of the upper jaw are closed secondarily. In order to close the large communicating orifice between the mouth and the nasal fossæ, recourse must be had to the mucosa of the cheek. The suppleness, the extensibility and the mobility of this membrane, its excellent blood supply, and its resistance render it very valuable for plastic purposes. It is a simple procedure to detach the buccal mucosa and to slip it inside, assisted by incisions applied anteriorly in the gingivo-labial groove and backwards, towards the posterior portion of the cheek. The accidental division of Steno's duct has no serious consequences, the divided canal apparently undergoing obliteration after a variable length of time. The difficulties of the operation are considerably diminished by resorting to local anesthesia.

This intervention may at once prove entirely successful, whereas in other less satisfactory cases the success is only partial and the gap is simply reduced

in size. Repeated attempts may be made, conducted in a similar way, with improved prospects of success in proportion to the reduction in size of the orifice by the preceding operations. In four patients who had previously undergone resection of the upper jaw, the author was enabled in this way to obtain the obliteration of a large, persistent communication between the mouth and the nasal fossæ. He emphasizes the fact that the buccal mucosa offers incredible resources in the reconstructive surgery of mutilated palates.

**Acute Ulcerative Gingivitis.** C. G. Colyer. *British Medical Journal*, October 12, 1918, p. 396.

Acute ulcerative gingivitis is an acute inflammatory condition of the margins of the gums, which spreads rapidly, and leads to sloughing of the interdental papilla; sloughing of the gums around the necks of the teeth; ulceration of the adjacent mucous membranes (in the more severe cases); rarefying osteitis and destruction of the bone around the teeth, in chronic cases. Severe cases of acute ulcerative gingivitis represented 0.65 per cent of all men reporting sick on account of their teeth, in the experience of the author as advisory dental surgeon in the British army.

Only a small proportion of men suffering from the condition report sick until the pain becomes severe, and there is considerable ulceration. Significant points affecting the army in connection with this disease are its contagious nature, the disability produced, and the subsequent loss of teeth unless treated early. The average duration of treatment in first attacks is ten days, provided treatment is vigorous. Less reliance than in the past is now being placed on the action of antispirochetal drugs, and more on thorough surgical cleansing of the infected areas. The treatment is laborious, and personal daily treatment by a dental officer is required for each case. Relapses are common, and probably chiefly due to inefficient treatment or too early discharge. The usual duration of the disease from the commencement of treatment is ten to fourteen days, patients usually becoming free from the specific organisms on the eighth or ninth day. Patients are not cured until the specific organisms (a mixture of *Bacillus fusiformis* and *Spirilla*) can no longer be found by bacteriologic examination.

**What Constitutes a Dead Tooth?** L. Novitzky. *Medical Review of Reviews*, xxv, No. 2, 1919, p. 94.

The fact that every pulpless tooth is a dead tooth is emphasized by the author, who adds that every dead tooth is subject to the laws of putrefaction and infection. Its one source of nourishment has been cut off, and without nourishment there can be no growth and no vitality. Every dead tooth is a source of danger, and from the viewpoint of preventive medicine the removal of all pulpless teeth seems to be advisable. Devitalization of teeth by dentists, through removal of the tooth pulp, is cautioned against as a dangerous procedure, which should be replaced by extraction in all cases where the survival of the pulp can not be secured. After putrefactive changes have become established in the dead tooth and in the underlying alveolar process, extraction will not be sufficient, and removal of the offending tooth and infected alveolar process is then

indicated by the operation advocated and used by the author since 1915. During the last five years extended radiographic study has convinced him that apical destruction is greater in pulpless teeth which have been treated and plugged than in pulpless teeth which have been neglected. No method has been devised which serves to preserve a pulpless tooth sterile or embalmed. When a pulpless tooth is removed by the dissection operation, a culture of pathogenic microorganisms can always be obtained from its root ends. A dead tooth and any infected area about its root ends should be removed from the jaw fully and cleanly. Its safe removal without danger of leaving infected alveolar process in the jaw, is possible only by the author's dissection operation described elsewhere.

**Abnormal Conditions of Enamel in Cases of Malnutrition.** L. Lawson Dick. *Lancet*, London, October 5, 1918, p. 456.

The author emphasizes that although the calcification of the enamel proceeds normally during intrauterine life in almost all cases, immediately after birth factors step in which interfere with the proper growth of the enamel, producing defects which are permanent and which are likely to weaken the defenses of the teeth and to lead to decay. The agents which determine the tendency to decay are those which affect the soft enamel organ in the earliest history of the tooth and not those which affect the enamel after the tooth has been erupted.

In his capacity as Assistant School Medical Officer, London County Council, the author was enabled to carry out comparative investigations of the teeth of 403 school children of eleven years and over, including 281 where nutrition was decidedly poor and 122 children of good nutrition. Out of the 281 poor children, 114, or 40 per cent, had defective enamel, as compared with 13 per cent among the better-class children. The commonest defect found in malnutrition is a chalky appearance of the enamel, varying from white patches or transverse bands on the surface of the enamel to a general opacity affecting its whole surface. Opaque patches affect chiefly the central incisors, the lateral incisors, and the canines in order of frequency, indicating errors of nutrition during the first two years of life, but are also fairly commonly found in the premolars and second molars, which must be due to conditions operating on the child between the second and sixth years. Another common and well-marked defect found in cases of malnutrition is represented by the brown lines of Retzius or brown staining of the enamel.

**Early Suturing of Wounds of the Face.** V. H. Kazanjian. *The Journal of the American Medical Association*, lxxii, No. 9, 1919, p. 626.

The fact is emphasized by the author, on the basis of his experience as surgeon of the Harvard Surgical Unit, that in order to obtain a minimum amount of facial disfigurement the method of early as well as late suturing must be followed in the treatment of war wounds of the face. The determining factors are the location and severity of the wounds, the amount of involvement of adjacent structures, and the degree of sepsis that has developed. Sepsis fractures and the loss of natural support are obstacles to successful primary suturing of wounds

of the face. On the other hand, superficial wounds with no loss of soft tissue and wounds with slight or no connection with the oral or nasal cavities in most instances may be closed successfully. General anesthesia is cautioned against in all gunshot wounds of the face and jaw, on account of the marked tendency of sepsis in the oral cavity to induce respiratory complications. The types of wounds suitable for early secondary suturing, which has a much wider scope than primary closure, are the following: (a) Wounds in which there is slight or no bony injury. (b) Wounds involving extensive bony injury *without loss* of soft tissue. (c) The radiating parts of certain wounds, as a definite step in preparation for a later plastic operation. The usual time of suturing is between the fifth and twelfth day after injury, depending on the nature of the wound, the condition of the patient, and the severity and duration of the infection. Fixation of the bony fragments and a control of sepsis always precede the operation. In case of wounds involving bony injury, all irritating and useless fragments of bone or teeth are removed, splints for the reduction of the fracture applied, and appliances in certain instances also used to support the soft tissues. Suturing is postponed until the local inflammation has subsided. In wounds involving extensive destruction of the soft tissues, it is necessary to wait for the disappearance of the suppuration and a healthy look of the wound before attempting the reconstruction of a part of the face. All flaps and appliances must be carefully planned. The prospects of the final operation are improved by careful preliminary treatment, by the control of scar formation, and by the maintenance of the oral cavity in a condition suitable for appliances or later oral restorations.

**Bucco-pharyngeal Manifestations of Typhoid Fever.** A. Campani and F. Bergolli. *La Riforma Medica*, 1918, No. 14, p. 264.

Changes in the buccal cavity and the pharynx are among the initial symptoms in an entire series of infectious diseases. The authors endeavored to establish these changes in 108 cases of typhoid and paratyphoid fever, respectively. Pharyngeal changes were found in fifty of these cases (46 per cent), fourteen times in the form of simple erythema, six times as a condition characterized by mucus and crust formation, eighteen times in the form of vesicle formation, three times as roseola, finally thirteen times as a typical ulcerative angina. A peculiar dryness and opacity of the teeth is especially emphasized by the authors as a sign of unfavorable augury. There is also a well-marked desquamation of the epithelium of the gums, occurring in benign as well as severe cases. This desquamation must not be confused with the gingival border described by French writers, which constitutes an early symptom of pulmonary tuberculosis. With special reference to the condition of the teeth, this is not absolutely dependent upon the dryness of the remainder of the buccal cavity, for it often persists after the tongue has become moist. According to the author's observations, this sign of the teeth is suggestive of a possible recurrence and represents a danger signal for the physician. A return of the fever was repeatedly noted in patients who were otherwise apparently convalescent but whose teeth nevertheless remained opaque and dry.

**The Anatomy, Physiology, and Pathology of the Interdental Space.**  
**W. Roos. Inaugural Dissertation, Zurich, Switzerland, 1918.**

The interdental space, viewed in the bucco-lingual direction, has the shape of a triangle with its base situated at the interalveolar septum. It is bounded in the direction of the mastication plane to the alveolar process by the alveolar septum; in the direction of the alveolar process to the mastication plane, by the point of contact of the approximated surfaces of the two adjacent teeth. In the macerated jaw, the interdental space, seen in the bucco-lingual direction, is open; in the unmacerated jaw, the entire space is filled by the interdental papilla. The latter serves to prevent the accumulation of food remnants and bacteria in the interdental space and thereby to protect the approximating surfaces of the teeth against caries. It furthermore prevents mechanical and chemical injuries of the circular dental ligaments and thereby also of the periodontium. Scrupulous care of the mouth is the foundation for the maintenance of healthy gums. The condition of the interdental papilla is of importance for the preservation of the teeth. All factors which are followed by permanent drainage of the papilla have serious results, be it because the approximating surfaces of the teeth become predisposed to caries, or because the penetration of food remnants and bacteria leads to the formation of pockets in the gums, with subsequent development of pyorrhea alveolaris, usually followed by loosening and loss of teeth; or finally, because the infection gives rise to a more or less severe pericementitis, originating from the infected pockets in the gums.

Pathologicoanatomic findings in animals have shown that as a result of chronic irritation from protuberant fillings an inflammatory process is set up which is followed by connective-tissue degeneration of the interdental tissue, osteoclast formation in the periosteum, and atrophy of the bony interalveolar septum.

Acute mechanical causes acting upon the interdental tissues are: Injuries with wooden toothpicks, separators, hickory wedges, exaggerated compression of the papilla with the elastic separator, detachment of the gums and of the bony interdental septum in extractions, injuries through orthodontic appliances, such as angle-rings, ligatures, or rubber rings. As the results of these lesions, the following are met with: secondary caries, gingivitis, pericementitis, abscess formation, necrosis of the papilla, atrophy of the papilla and the bony septum, infection and pyorrhea alveolaris, loss of the tooth. Chronic mechanical causes are active in the presence of protuberant fillings, loose crown rings or badly fitting rings of orthodontic apparatus, dental fillings with imperfect points of contact, deposits of tartar. The results are gingivitis, edematous swelling and congestive cyanosis of the gums, chronic proliferation, partial neurosis of the gums, atrophy of the bony septa, formation of pockets in the gums and development of pyorrhea alveolaris, secondary caries, pericementitis and loss of the tooth.

Concerning clinical features it is well known that all severe affections of the oral mucosa, and especially of the gums, may under favorable conditions lead to more or less extensive neurosis. Arsenic or cobalt in the interdental space invariably leads to neurosis of the papilla and in part also of the bony septum. Pathologic conditions of an infectious character are found wherever a

lesion or detachment of the gingival tissue provides an entrance for food remnants and bacteria. The avoidance of all these injurious factors, the removal of chronic irritants, suitable care of the interdental space, and conscientious work on the part of the dentist will result in the preservation of a healthy masticatory apparatus for the patient and in his protection against much pain and suffering.

The author's investigations of the interdental space and the various factors which affect it, are based upon a material of 380 patients. In addition, attempts were made by experiments on animals to produce the analogous destructive processes seen in man, and to study these changes through histologic examination of the corresponding tissues of the interdental space.

### **Surgical Treatment of the Pseudoarthroses of the Inferior Maxillary.**

P. Sebileau. *Bulletin et Memoires de la Societe de Chirurgie de Paris*, 1918, xliv, No. 26, p. 1308.

The author discusses the results of his method of osteoperiosteal grafts in the treatment of pseudoarthroses of the lower jaw due to war injuries. Altogether thirty-four patients were operated upon, but as five operations were of very recent date (less than three months) at the time of the report, these are not included in the statistics, reducing the number to twenty-nine cases. The outcome of these twenty-nine operations was as follows: Five complete and permanent failures; five partial failures with anatomic and functional improvement, but no prospect of bony consolidation; four considerable improvements which will probably terminate in bony consolidation and reestablishment of the masticating function; fifteen anatomic cures through bone repair and functional restoration. All the grafting operations were performed under general anesthesia after intercricothyroid laryngotomy. There was no mortality and no complication worth mentioning; neither bronchopneumonia nor erysipelas occurred among these patients. On the other hand, thirteen patients presented a few days or weeks after the operation a serous, seropurulent or purulent discharge, coming from the operative focus. This percentage of suppuration is enormous, but is readily explained as follows:

1. Exacerbation of the latent microbism in the focus of open and infected fractures.
2. Bad conditions of the integument covered by scar tissue, which often breaks down after the operation, thus exposing the area of the graft to infection from the outside.
3. Accidental perforation, in the course of grafting, of the bucco-vestibular mucosa.

Suppuration was almost invariably followed by complete or at least partial elimination of the tissue-graft or metal prosthesis. Its occurrence therefore plays a most important part in the plastic and functional results of the operation. Notwithstanding its failures, the grafting method is undoubtedly advantageous in the treatment of pseudoarthroses of the lower jaw. Anatomic specimens are available, showing that the graft survives, becomes transformed



and hypertrophied, its sharp edges becoming fused into a common mass which assumes the appearance and consistence of a normal bone, adapts itself to the surrounding tissues and finally becomes incorporated with the fragments which received the graft.

Premature operations should be avoided in cases of pseudoarthroses of the lower jaw, and the author does not consider it advisable to operate before eight months. In order to safeguard the life of the graft in the aseptic environment which is indispensable for its survival, it is desirable to get away from the long period of suppuration and formation of sequestra through which all infected fractures must pass.

**Recent Work on Anæsthetics.** J. Blomfield. Practitioner, London, 1918, ci, 279.

Cotton, of Toronto, is quoted as saying, "Ethyl ether is not an anæsthetic, and the analgesia which comes from the administration of commercial ether is not due to ether, but rather to the impurities occurring in it." The impurities may be alcohols or acetones, which act antenally, or aldehydes, which irritate the nasopharynx or bronchi. Absolute di-ethyl ether will not anæsthetize. If a small amount of carbon dioxide is present, the patient enters anæsthetic and analgesic stages. To obtain anæsthesia proper, one must have acting a narcotic together with an analgesic, e.g., di-ethyl ether and carbon dioxide.

The use of anæsthetics in war surgery at the front continues to provide much difference of opinion as to the best methods in cases of severe shock and hæmorrhage. Spinal anæsthesia, from which much was hoped, is in most hands regarded as disappointing and dangerous in these cases. Gwathmey finds that the performance of painful dressings gives a wide field for most advantageous use of oral anæsthesia.

Discussing the toxic factors of some of the common anæsthetics, Graham advances the view that the evil effects of chloroform are due to hydrochloric acid originating in the body from the decomposition of the anæsthetic. Certain anæsthetic substances, notably those which belong to the group of alkylhalids, are capable of yielding strong mineral acids in the tissues as dissociation products. For example, chloroform is broken down in such a way as to yield hydrochloric acid in the body.

The comparative efficiency of local anæsthetics has been subjected to experimental investigation by Sollman. The relative efficiencies, as established by experiment, are summarized thus:

1. For anæsthesia of mucous membranes, cocaine, beta-eucaine, alypin, and tropacocaine are the most useful. Alkalinization increased the efficiency from two to four times; the mixtures, however, do not keep well and must be recently made.

2. For infiltration and injection anæsthesia, cocaine, novocaine, tropacocaine, and alypin are equally efficient. Beta-eucaine and quinine with hydrochloride are intermediate; apothosin and potassium sulphite (or chloride) are inefficient. Efficiency is not increased by alkalinization. Several of the synthetic substances can completely take the place of cocaine.

Local anæsthetics are preferred by Farr in the performance of abdominal operations of all kinds. Novocaine is the anæsthetic preferred. For orthopedic operations Elmer favors ether and nitrous oxide and oxygen, and insists on the desirability of only light narcosis.

### **RADIOGRAPHY, Etc.**

#### **Interpretation of Radiographs. Henry W. Gillett. Journal of the Allied Dental Societies.**

Radiographs are at best uncertain means of diagnosis, and for any man, be he dentist, physician, or merely expert in radiography, to attempt to diagnose dental conditions from a radiograph alone, without accurate knowledge of the clinical conditions, will very often mean "ghastly mistakes."

We need the radiograph constantly in dental practice, not only for diagnosis but to judge of the progress of the work, and the only chance of getting its best service is when the operator fits himself to make and interpret his own radiographs. It is my understanding that in this state any radiographer without a dental degree who attempts to make a dental diagnosis from his radiographs infringes the dental law. I believe we should take measures to see that this feature of the law is enforced. I express this opinion, not because of any feeling concerning the ill effects of non-enforcement which may accrue to individual dentists, but because we shall not be doing our duty by our *clientèle* unless we do our best to protect them from incompetent and unwise radiographic interpretation.

It is essential that practitioners should fit themselves to interpret radiographs skilfully, and when any man has reached that point and is not ready to do his own radiography, he is in position to refuse to employ any radiographer who attempts to add unsolicited diagnosis to his functions.

#### **Limitations of the Radiograph in Diagnosing Dental Lesions. George F. Thomas. Dental Summary.**

The limitations of radiography as a means of diagnosing dental lesions are of course familiar to all who have used it. Some of the early stages of inflammation will not show up; one may not be able to state whether a certain area is an active focus of infection or whether another is healed to nature's satisfaction; but nevertheless, in spite of these limitations, radiography is a valuable addition to the diagnostic armamentarium of the dental profession. In the illumination of those hidden foci of disease, unsuspected and undemonstrable by other methods, roentgenology has a proud achievement which, indeed, may be included as one of its most beneficial contributions to medical science.

#### **Systematic Development of X-Ray Plates and Films. Millard B. Hodgson. New York Medical Journal.**

If the delicate nature and extreme sensitiveness of photographic materials were better understood, there would probably be fewer poor negatives in all branches of photography. In average amateur photography of the better class

the operator is usually an enthusiast who has gone to considerable trouble to inform himself of the nature and possibilities of the materials with which he is working. With him it is a recreation. In the case of professional work, the photographer is usually one who has spent years in photographic practice.

With the average radiographer, however, photographic processes are but a means to an end and are very seldom considered as they should be. He fully understands the technic of taking the picture and he is able to interpret radiographs correctly, but too often he loses the efficiency that this knowledge should give him by faulty photographic work.

Few average radiographers have proper darkrooms. Any small cupboard or room may be made into a proper darkroom by observing a few simple rules. First, all cracks and holes for the entrance of outside light should be carefully plugged up. This done, the room should be illuminated by light of photographically safe quality. For a safelight of very moderate cost the Brownie safelight lamp is ideal for a small dark room. For larger rooms, the Kodak safelight lamp or the Wratten safelight lamp may be used. Any of these lamps will provide illumination of safe quality. A convenient bench should be at hand for the manipulation of trays or tanks containing developer, wash water and fixing bath, and, if possible, running water should be accessible.

Development is rarely considered as the chemical reaction that it is. The reduction of the photographic image to a silver deposit giving the finished image is a process of extreme delicacy. There is the utmost need of cleanliness, as with any other delicate chemical reaction. There should be a constant condition of temperature, purity of chemicals, and precision of timing. To eliminate difficulties in development so that the operator does not have to be trained chemist to obtain good results the Eastman Kodak Company has prepared certain kinds of developing powders which are of the proper purity and have been precisely weighed. These may be mixed properly by anyone if a simple direction sheet is followed.

After the completion of the development of the image, which is one chemical process, another chemical process must take place before the negative is complete, that is, the plate must be fixed, to remove unused and undesired materials. Before using an apparatus in any chemical operation, it is good practice to wash it thoroughly. The same rule holds good in the case of the photographic plate, which should be washed after the first chemical process (developing) and before the second chemical process (fixing) is performed. Now the finished image consists of a metallic silver deposit, the image, in gelatin. These materials in a dry state are relatively permanent. It is to render them so that all the chemicals which would affect this condition of permanency should be removed by thoroughly washing after fixing. The negative should then be dried in a place where there is no dust.

If these rules are adhered to, that is, 1, development under standard conditions for a fixed time; 2, proper rinsing between development and fixing; 3, thorough washing; 4, careful drying, all negatives that are reasonably exposed should be good negatives. A comparison of the work of individuals using this system, with others using haphazard methods will be sufficient to prove the point.

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## EDITORIALS

### A Problem in Dental Education

THERE is no other subject about which there exist so many diversified opinions or about which it is so easy to start an argument as that of dental education. The fact that so many different organizations, societies, and committees have suggestions to make regarding the situation proves that the question is one which is by no means satisfactorily settled. Every one who has been engaged in the practice of dentistry for a few years can remember the first attempt that was made to place dental education on a four-year basis, and then for some reason or other it went back to three years, and now again the four-year course has been adopted. In a great many states the laws have been changed to make four years compulsory before the candidate can pass or appear before a state board for examination. Along with the increased length of the dental term, the

entrance requirements have been raised until now a student must be a high school graduate, having taken four years of high school work. In some states these entrance requirements are so outlined that, not only must the student have four years of high school work, but he must have taken a certain number of special subjects during those four years and no other subjects can be substituted for those required. Not being satisfied with a preliminary requirement of four years of high school work some individuals and educators are advocating a higher preliminary education and a longer dental course. We also find certain schools boasting of the fact that their classes are limited to a small number of students, and those students are selected from the candidates having the highest preliminary education.

We have always advocated raising the dental profession by means of better education, but under the present plans that have been adopted there is a serious thing to be considered regarding the final outcome. The question is whether the lengthening of the dental college course and the raising of the preliminary requirements is going to raise the standards of the profession and produce a dental profession that is better able to serve the public than the dental profession has done in times past. In regard to dental and medical education a few men have questioned the wisdom of a long preliminary education as a requirement to the study of medicine and dentistry and then long years of special training. The question has been asked whether it would not be better to devote the time to dental education, thereby giving instructions only in those subjects which will make a student a better professional man, and not spend a number of years with high school and college subjects that have no particular bearing on dental or medical education. By careful study and analysis of the curriculum of the four-year dental course it will be seen that very little more time is given to the study of dental subjects in four years than was given to those same subjects in three years. In other words, would it not be better to give more intensified training on dental subjects during three years than to lengthen the course to four years, thereby causing the man to enter his professional life a year later?

The real purpose of any profession is to serve the public and we believe that the public will not receive better service as a whole by colleges turning out a few men who have spent a great many years in educational work along lines that do not necessarily enable them to be better professional men or to render better service to the public. The service to the public is limited to the number of patients that a dentist or physician can take care of. A man may spend four years in high school work, obtain a college degree, then spend four years in dental college, and at the end of that time, he will not be able to take care of any more patients than a dentist who was formerly only a high school graduate and took only three years of dental work. The increased preliminary education is going to diminish the number of dental graduates, and as a result of that, there will not be a sufficient number of men take up dentistry to care for the needs of the public.

This condition was illustrated both in the medical and dental professions when a number of men from both professions were called into service. It was found that not enough men were left home to take care of the public needs. We know of communities where all the dentists were in the service and no one

was left to take care of the civilians. While this was the result of an unusual condition, a similar circumstance will develop in the next few years if a higher preliminary education is necessary and more time is required to complete a dental course. The number of men graduated will be greatly reduced. Some say that if the dentist is more highly educated and spends more time in getting his education, he will render better service to the public. That may be true in one sense of the word, but while he may render better service, he will render that service to only a few individuals who are able to pay his price. As an example we might call attention to a few men in the profession who have specialized in prosthetic dentistry and are making wonderful dentures, the most efficient dentures that have ever been made; but they are making them at a price that the average individual is unable to pay, and are spending so much time on them that they do not turn out more than one set a week. In that case they have rendered indeed a service to one person, but there may be four or five persons who can not receive that service. There are other men who are making dentures for fifty dollars that by no means compare with the ones made by the highly skilled men for five hundred dollars, but the fifty dollar dentures render a service to the individual, and he is better off than he would be if he had no artificial teeth. In addition to this, a man who makes dentures for fifty dollars will take care of five patients while the highly skilled man is taking care of one.

Another example of high preliminary education working to the disadvantage of the public was shown by an editorial that appeared in *Journal of the American Medical Association* and also by several articles that have appeared in the daily press of Chicago. These statements dealt with the question of the registered nurse. For instance, a graduate nurse in Illinois is an individual who is a high school graduate and has spent three years in hospital training. There is no question about the efficiency of such a nurse, but those who have taken this long training, with the preliminary education, necessarily have reached a standard which places them entirely beyond the use of the average family. Such a nurse wants to work in the laboratories and operating rooms in hospitals; if she takes a private case, her salary is so great that the ordinary family can not afford it. As a result of this there has been an effort in Illinois to provide practical nurses who are not required to be high school graduates and who are required to take but eighteen months of hospital training. Such a nurse will be able to serve the average family just as efficiently as a highly educated and highly trained nurse, and would render a greater amount of service to the public than the registered nurse who is a high school graduate with three years of hospital training. The medical profession and the public in the city of Chicago and in Illinois, as a result of the recent influenza epidemic realized that some provision must be made for the benefit of the public, whereby nurses can be educated so as to be able to place their services within the reach of the average family. The shortage of nurses as a result of high preliminary education and the long years of training is an actual fact that has been recognized by medical journals and the press. However, in the face of these facts, men interested in dental and medical education are still rushing forward to the same condition as regards practitioners of medicine and dentistry.

We wish to clearly state that we are in favor of the better educated dentist,

but we are in favor of educating and making better dentists by intensifying and increasing the efficiency of dental education and giving them training in as short a time as possible, along lines that will increase their value as professional men, and thereby enable them to better serve the public. Any plan that is to reduce the number of dentists and increase the time required for their graduation is going to be an economic mistake for which the public is going to pay in one way or another. Any time that is spent upon preliminary education beyond the period where the applicant has received enough education to enable him to grasp professional subjects is going to be a waste of time so far as benefit to the profession is concerned. The required study of a lot of subjects which have no direct bearing upon his professional work is going to be time wasted so far as the good of the public is concerned, and will simply work a handicap by diminishing the number of men who enter the profession, thereby causing a decreased number who are able to care for the people. The real answer to the problem of dental education is: increase the efficiency of professional education rather than lengthen the time of preliminary education, stretching out the professional subjects to a greater number of years than are really required.

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### **The American Society Of Orthodontists**

**T**HE nineteenth annual meeting of the American Society of Orthodontists was held in St. Louis, March 10, 11 and 12, 1919, with Dr. O. W. White, Detroit, Michigan, as president. Many papers of high character and great scientific interest were read and discussed. The attendance was good. The officers for next year are: President, Dr. John G. V. Mershon, Philadelphia, Pennsylvania; Secretary, Dr. Frank M. Casto, Cleveland, Ohio; Treasurer, Dr. Burt Abell, Toledo, Ohio. Chicago, Illinois, was selected as the next place of meeting; time, first week in April, 1920. The scientific proceedings will appear in future issues of the JOURNAL.

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### **The Alumni Society of the Dewey School of Orthodontia**

**T**HE ninth annual meeting of the Alumni Society of the Dewey School of Orthodontia was held in St Louis, March 6, 7, and 8, 1919, under the presidency of Dr. A. O. Oliver, Nashville, Tennessee. Several interesting papers were read and freely discussed. These papers with the discussions on them will be published in future issues of the JOURNAL.

The following officers were elected for the ensuing year: President, Dr. E. G. Weeks, Saginaw, Michigan; Vice-President, Dr. S. W. Bradley, Ottawa, Canada; Secretary-Treasurer, Dr. George F. Burke, Detroit, Michigan.







JOHN V. MERSHON, D.D.S.  
President of the American Society of Orthodontists, 1919

# The International Journal of Orthodontia and Oral Surgery

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## ORIGINAL ARTICLES

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### BIOMETRICS\*

BY ROBERT H. LOWIE, PH.D., NEW YORK CITY, N. Y.

*From the Department of Anthropology, American Museum of Natural History*

WHEN Dr. Hellman requested me to address your Society on the subject of biometrics, I was at first disposed to decline the invitation. Biometrics is the application of mathematics to biological phenomena, and while I have done some statistical work, I am neither a mathematician nor a biologist. I decided to accede to Dr. Hellman's request because there exist misconceptions of the gravest sort concerning the utility of biometrics even among some of the most distinguished biologists. The aversion from exact statistical treatment of their data has communicated itself to not a few of the younger biologists, who dogmatically reëcho their masters' prejudices. In attempting to combat these dogmas, first by a brief examination of the logic of the case, secondly by a few concrete illustrations of how mathematical treatment has actually illuminated biological questions, I thought I should be rendering something of a public service.

#### THE FUNCTION CONCEPT

Up to the present day the determination of causes—*rerum cognoscere causas*—has been commonly assumed as the ultimate aim of scientific investigation. But in recent times advanced thinkers among the philosophers of science have found the concept of causality lacking in definiteness and are supplanting it with the mathematical concept of function. From their point of view, the entire universe appears as an assemblage of elements more or less closely dependent on one another, and the object of science is to ascertain the *functional* relationships of these elements.†

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\*Lecture delivered at the Annual Meeting of the Eastern Association of Graduates of the Angle School of Orthodontia, May, 1912, New York, N. Y.

†Foremost among those holding this point of view stands Professor Ernst Mach (Vienna). Cf. his *Die Analyse der Empfindungen*, ed. 5, Jena, 1906, pp. 73-77.

What, precisely, are you to understand by the term "function?" *The quantity "y" is a function of the quantity "x," if "x" and "y" are so related that to every value which "x" may assume there correspond one or more values of "y."* Thus, the cost of a package of tea is a function of its weight because the greater the weight the greater (other things being equal) is the cost. The time required to perform a journey is a function of the distance, because (other things being equal) it varies with the distance. The algebraical expression  $y^2$  is a function of  $y$ , for whatever values we assign to  $y$  we obtain a corresponding series of values for  $y^2$ .

The so-called natural laws of physics are expressions of such functional relationships. Let us take one of the simplest of physical laws for an illustration. Boyle discovered that, when other conditions remained constant, the pressure and the volume of a gas are inversely proportional: the less the pressure, the greater the volume, and *vice versa*. In other words the product of the pressure and the volume is a constant quantity. Pressure is a function of volume, and volume of pressure.

Now it is of the utmost importance for you to understand how the formulation of such a rule as Boyle's Law originated. I have not at my disposal, at this moment, the record of Boyle's observations. In their place I wish to substitute a table of observations on soap bubbles leading to a similar law. The pressure of the air confined within the bubbles and the diameter of the bubbles are as follows:\*

$d$ Diameter of bubble	$p$ Pressure of Confined Air	$dp$
7.55	3.00	22.65
10.37	2.17	22.50
10.55	2.13	22.47
23.35	0.98	22.88
27.58	0.83	22.89
46.60	0.48	22.37

You observe that as  $d$  increases,  $p$  decreases. The product  $dp$  is approximately the same, no matter what may be the value of  $d$  or  $p$ . For all practical purposes the slight variations are negligible. We may, accordingly, idealize our table, simplify it by abstracting from the variations, and express the somewhat cumbersome table in the form of a shorthand résumé, to use Professor Pearson's phrase, and write the equation:  $dp = d_1 d_1 = \text{constant}$ . The diameter is a function of the pressure, and the pressure of the diameter.

You will now be ready to grasp the fundamental proposition of biometrics, which is simply this: that the student of biology is able to apply mathematics to his problems in essentially the same way in which the physicist applies mathematics to physical phenomena,—that by abstracting from observed reality unessential conditions he is able to describe the resulting simplified group of phenomena by a mathematical expression of functional relations that represents with sufficient accuracy the phenomena observed. True, the conditions may be less readily simplified in biology than in physics: my point is that the *principle* involved in the application of mathematics is in both cases identical. Logically, there is not the slightest reason why the predictions of a physicist with regard

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\*Young and Linebarger: The Elements of the Differential and Integral Calculus, p. 5.

to the movement of falling bodies or those of an astronomer as to the rotation of the heavenly bodies should be less liable to error than the biological predictions of the actuary of a life insurance company. As a matter of fact, we know that the physicist's and astronomer's predictions are verified in the majority of instances. And probably you are aware that the life insurance companies are not exclusively charitable institutions, but that the calculations of the actuary, founded on a statistical study of the *biological* phenomenon of mortality results, as M. Poincaré has humorously pointed out, in the payment of dividends to shareholders. The skepticism of the biologist with regard to the application of mathematics can not consistently be limited to biometrics but must be extended to mathematical physics and celestial mechanics; and in each of these cases the pragmatic test seems to rule his skepticism out of court.

# REGULARITIES IN BIOLOGICAL PHENOMENA

Mathematical treatment of biological, as of physical phenomena, however, presupposes the possibility of noting a certain *regularity* in the behavior of the facts studied. If every falling body differed very considerably in velocity from every other falling body, no law of gravitation could ever be formulated. In studying such a biological phenomenon as the stature of a definite group of human beings, it would be absolutely impossible to represent the facts by a shorthand formula, an expression of functional relationships, if people of the same kinship group and living under the same conditions belonged to quite different stature groups, if Lilliputian parents, to put the case drastically, gave birth to a gigantic brood like the devourers of Mr. H. G. Wells' "Food of the Gods," and if their issue in turn fell within all conceivable orders of stature. As a matter of fact, it has been found that the distribution of statures in any one definite locality is markedly regular. Thus, Johannsen quotes from Quetelet the following figures giving the height of 1,000 American soldiers.\*

## Stature of American Soldiers

	Number of individuals
5 feet 0	2
5 feet 1	2
2	20
3	48
4	75
5	117
6	134
7	157
8	140
9	121
10	80
11	57
6 feet 0	26
6 feet 1	13
2	5
3	3
	<hr/>
	1000

Such figures could be multiplied almost indefinitely. Wherever a relatively

\**Elemente der exakten Erblchkeitslehre*, Jena, 1909, p. 8.

pure population has been measured for height, the distribution of statures has been found to resemble that given for American soldiers. There is a congestion of frequencies about a central point corresponding to the average stature. As we take statures lower or higher than this central point, the associated frequency gradually diminishes until finally, say at the height of 4 feet or 7 feet, we find not a single member of our series. There is thus a characteristic correlation between frequency of occurrence and height within a definite group of observed individuals.

#### THE THEORY OF PROBABILITY

*The Functional Relationship in Biology.*—The fundamental question for us is this: Can the correlation between the frequency and the value of a certain measurement be definitely formulated in terms of a functional relationship? It has been shown that such is indeed the case: just as in the physicist's formula we may substitute any value we please for  $t$  (the time) in the formula for falling bodies, viz.,  $l = \frac{1}{2}gt^2$ , and calculate  $l$  (the distance traversed), so it is possible to assign an arbitrary value to the stature and calculate therefrom the correlated frequency of occurrence. Without going into details or attempting to give the mathematical processes, a few words on the theory of probabilities will be in place here to give you some notion of the methods applied.

By the probability of an event we understand the ratio between the chances favorable to the occurrence of the event to the total number of chances for and against it. For example, if I throw a coin in the air, either the head or the tail may turn up. There are two possibilities, and one chance favorable in each case; hence the probability of a head turning up is  $\frac{1}{2}$ , and this is also the probability for a tail. It has been shown experimentally that when a coin has been thrown up say 16,000 times, there will be actually about 8,000 heads and 8,000 tails. If we throw up a coin, it is obvious that it *must* turn up either head or tail. The event of *either* turning up is, strictly speaking, not probable, but certain, and this certainty we denote by 1. On the other hand, if an event is absolutely impossible we denote its probability by 0.

This terminology can be readily applied to the frequencies of our table of statures. The total number of individuals measured being 1,000,\* we express the probability of any measurement by one-thousandths of its frequency. Thus, there are 157 men of the stature 5 feet, 7 inches; the probability of that stature is accordingly  $\frac{157}{1000}$ .

It can be shown that the entire distribution of a stature series, as well as of many other variable measurements, can be briefly formulated by reference to *two* easily calculated values: the Average and the Standard Deviation ( $\sigma$ ). The latter is simply the square root of the sum of all the squares of the deviations from the average, and serves as the measure of group variability. We can use the value of  $\sigma$  as a measure of variability in this sense that, provided our series conforms to the type of distribution usually found in stature series, we can calculate the probability of any deviation whatsoever from the average. It has been shown that in such a case the probability is about  $\frac{68}{100}$  that a deviation

\*As a matter of fact, the table given represents a reduction of the actual frequency of measurements to a total of 1,000.

will not exceed the standard deviation. In other words, if the average height of a group of 1,000 men is 5 feet, 7 inches, and the standard deviation 3 inches, about 680 men may be expected to have a height falling between 5 feet, 4 inches, and 5 feet, 10 inches. Now, that a deviation will not exceed the value of *twice* the standard deviation is much more probable, the figure being  $95\frac{4}{1000}$ ; that is, to use our illustration, of 1,000 men only 46 will be either shorter than 5 feet 1, or taller than 6 feet 1 in. Within the limits of the Average plus  $3\sigma$  and the Average minus  $3\sigma$  there will be a still greater percentage,—of 10,000 men we should have 9973 not shorter than 4 feet, 10 inches or taller than 6 feet, 4 inches. Finally, when we take a deviation of  $4\sigma$ , the probability of such a deviation becomes so slight that it can be practically disregarded. In the case cited, out of 100,000 men we should find only 6 taller than 6 feet 7 in. and shorter than 4 feet 7 in. Comparison with a table of probabilities (such as mathematicians have prepared) enables us at once to determine the probable frequency of an arbitrarily selected measurement.

At this point I should not like to omit mentioning that the type of distribution exemplified by our stature series is far from being the only one actually found to occur in biological phenomena. Where it does not obtain, however, the biometrician's duty is exactly the same in principle as when it does hold. He must try to find some other way to summarize the facts, and here again his task does not differ in principle from that of the mathematical physicist in a corresponding predicament. For the sake of simplicity, solely, I shall confine my examples to cases of the type indicated.

#### PRACTICAL APPLICATIONS

Let us now see how we can practically apply our theory of probabilities. The problem that frequently confronts us is this: Do observed differences between two series compared represent *real* differences or are they dependent on accident? You must remember that while any group we may measure is, at least theoretically, composed of an infinite number of members, we never actually measure more than a limited number of individuals. You can easily see that if I attempted to determine the average height of this audience by picking out and measuring a single individual, I might pick out one that was 6 feet 3 or 5 feet just as likely as one that approached the real mean height. If I selected two individuals, it would be much less likely that both should be extreme variants; the average of the two would probably incline somewhat more towards the general height. For a larger series of measurements, the *error* of the average as compared with that of an ideal, infinitely large series still exists, but can be measured by the ratio of the standard deviation to the square root of the number of

cases,  $\frac{\sigma}{\sqrt{n}}$ . If 10,000 men from the towns of a country have been measured, with an average of 170 cm. and a standard deviation of 7 cm., the error of the average is  $\frac{\sigma}{\sqrt{n}} = \frac{7}{\sqrt{10000}} = \frac{7}{100} = .07$  cm.

Suppose further that in the rural districts of the same country we also measure 10,000 individuals and get the average of 169 cm. with a standard deviation

of 10 cm. Obviously, the error of our average here is  $\frac{10}{100} = .10$  cm. We now have sufficient data for a comparison of the height of the urban and the rural population, for we have a rule for determining the probability of a difference of 1 cm. Without such a rule we could say nothing as to a stature difference between country and town folk, for as both series are limited, we could not know from the averages alone whether they fell within or without each other's normal accidental range. The formula in question, that is, the formula for the

error of difference is:  $\sqrt{\epsilon_1^2 + \epsilon_2^2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$

In our example  $\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} = \sqrt{\frac{49}{10000} + \frac{100}{10000}} = \sqrt{\frac{149}{10000}} = 0.12$  cm.

Hence the error of the difference is .12. As the probabilities of errors follow a similar law to that of the probabilities of deviations from the average, it would be exceedingly improbable that our averages should be too large or too small by more than 4 times 0.12 cm. But our *observed* difference is more than 8 times as large as the error of the difference. We should then be quite safe in declaring that there is a real, not an accidental, difference between the stature of city people and of rural people.\*

The method I have just outlined has innumerable applications in all the sciences dealing with variable phenomena, and as you are primarily interested in such applications rather than in the underlying mathematical considerations I will give several other illustrations.

Some years ago Dr. Channing investigated the hard palates of normal and feeble-minded individuals with the end of determining whether they revealed any real differences. Later he collaborated on this work with Dr. Wissler as biometrical adviser. From their joint publication† I take the following illustrations:

COMPARISON OF THE DISTANCE BETWEEN FIRST MOLARS

	n	Av.	$\sigma$
Normal	126	34.75	3.35
Feeble-minded	125	33.77	3.61
			<hr/>
			3.35
The error of the first average is			$\sqrt{126} = .30$
			<hr/>
			3.61
The error of the second average is			$\sqrt{125} = .32$

The error of the difference will be  $\sqrt{.30^2 + .32^2} = .44$ . The observed difference of the averages is only .98cm.,—only about twice as great as the error. In order that we could safely regard the differences as *real*, the difference would have to be four times as great as the error. Hence, we can not consider the hard palate of normal individuals and of feeble-minded individuals to differ in this particular feature.

\*Westergaard; loc. cit., p. 187.

†The Hard Palate in Normal and Feeble-minded Individuals, *Anthropological Papers of the American Museum of Natural History*, i, pp. 283-369.

## COMPARISON OF THE WIDTH AT THE CANINES

	n	A	$\sigma$
Normal	112	23	2.24
Feeble-Minded	124	22.36	2.61

$$e_1 = \frac{2.24}{\sqrt{112}} = .21$$

$$e_2 = \frac{2.61}{\sqrt{124}} = .23$$

$$\sqrt{.21^2 + .23^2} = .31$$

The observed difference is .64,—again only little more than twice the error of the difference. Accordingly, here again the theory of a real difference between our two series stands unproved.

Let me add an illustration from a different field. Some years ago thousands of Toronto school children were measured as to their height and other anthropometric traits, and a considerable number of facts were simultaneously noted as possibly serving to explain conditions that had to do with differences in the traits measured. Among these facts was the occupation of the children's fathers, which of course gave an approximate clue to their social position. An obvious question was whether social position and the conditions that go with it have anything to do with, for example, the children's *stature*. In order to determine this point we must separate our material into groups. Let us, then, tentatively separate the children of business and professional men from those of workingmen. Let us take the averages and standard deviations of our two groups. Suppose the ten-year-old boys of the well-to-do classes average 130 cm., while those of the poorer classes average only 128 cm. So far you do not yet know whether this difference is a really significant difference. You must accordingly resort to the rule of errors. If the number of cases is 100, and the standard deviation 6 cm. for both groups, then you have the errors

$$e_1 = e_2 = \frac{6}{\sqrt{100}} = .6$$

$$\sqrt{e_1^2 + e_2^2} = \sqrt{.36 + .36} = \sqrt{.72} = 0.848$$

The error of the difference then is 0.848.

Now, the observed difference is 2 cm. Dividing this by the error of the difference you have a ratio of 2 : 0.848. This is less than a ratio of 3 : 1, while you could not safely assume a real difference unless the ratio were at least 4 : 1. Hence it is not certain from the data at hand, whether social differences affect the stature of ten-year-old Toronto boys. But now assume that instead of having obtained the averages and standard deviations from groups of 100, you had had groups of 10,000 to deal with. Then



$$e_1 = e_2 = \frac{6}{\sqrt{10000}} = \frac{6}{100} = .06$$

$$\sqrt{e_1^2 + e_2^2} = \sqrt{.0036 + .0036} = \sqrt{.0072} = 0.085$$

The ratio of your observed difference to the error of the difference now becomes as 2 : 0.085. That is to say, the observed difference is more than twenty times the error, and accordingly you would be quite safe in asserting a real difference between the two groups, a real difference due to social position and its correlates.

This example is especially well fitted to illustrate the processes involved in biometric investigation. We started with the assumption that social position might affect the stature of children. Why did we make this assumption? It could not be suggested by biometrics or statistics any more than arithmetic could suggest to Galileo that the velocity of a falling body varied with the time. Galileo made *his* assumption because observation taught him that a body falls more and more rapidly as it descends. We made *our* assumption because observation seems to indicate that, other things being equal, the children of fairly prosperous parents are better nourished and taller than those of needy parents. In both cases the assumption must be tested by experience. If our assumption is not supported, we must frame some other assumption and see whether that works any better until we finally disengage some factor that does affect stature or whatever trait we are studying. These assumptions will depend not on our biometric, but on our biological, knowledge. We shall not waste time in considering assumptions that are quite contrary to all our biological experience, but shall select factors that bear a probable relationship to stature in the light of our present knowledge. But after we have done this, the exact formulation of our problem and the testing of our assumption becomes a matter of biometrics.

#### CORRELATION

In attempting an exact investigation of variable phenomena, we frequently have to ascertain not only the functional relationship between a certain measurement and its frequency or probability, but also the functional relationships between two or more measurements of a different order. We all know that tall men have in general a longer finger-reach than short men and are, on the whole, heavier than short men. We also know that this dependence is not an absolute one, for sometimes a very short man far outweighs one of superior height and, though rather more rarely, has a longer reach. Can we obtain a measure of the extent of correlation?

It would not be profitable in consideration of our limited time, to exemplify the method of computation employed, for which I should like to refer you to the popular account in Prof. Pearson's "Grammar of Science" (2nd edition, p. 392 ff.). But a single example, taken from the same work, may give you a glimpse of the logical aspect of the questions involved.

According to a popular belief, tall men and women have a tendency to marry short members of the opposite sex, and *vice versa*: in other words, there is a negative correlation between the stature of husbands and of wives.

The conceivable possibilities are as follows: Either the stature of the mate plays no part at all in the choice of a partner: in this case the correlation would be zero. Or, the statures of the mates vary with each other and are absolutely dependent on each other, so that the stature of a husband would be fully determined as soon as we knew that of his mate. This would be positive correlation in the highest possible degree, which may be indicated by the "coefficient of correlation" + 1. Or, we might have the condition favored by the popular belief if put in an extreme way. That is to say, the stature of either mate would again be fully determined by that of the other mate, but measurements would vary inversely with each other. This would be complete negative correlation and might be symbolized by -1. Finally, we may cite the only possibility that is actually realized, namely, that the stature of husbands determines that of wives to some extent, but does not *fully* determine it. That is to say, there is *some* correlation, whether negative or positive, but the choice of partners is affected by influences other than stature.

In order to test our popular theory, let us take 1,000 married couples, classing either the wives or the husbands in stature-groups. Now let us ascertain what is the average of the husbands or wives correlated with each of the stature-groups. It is clear that if there were *no* correlation whatever, the "arrays" of husbands or wives with each group of wives or husbands would be the same. No matter whether we took wives of 4 feet 6 or of 6 feet 1, we should invariably get men of the general average height associated with them. If, on the other hand, the inverse relationship supposed by popular belief existed, we should have female six-footers associated with men averaging say 5 feet, while men 6 feet 4 would form the array for women of 4 feet 6. What we actually do find is this: "—if the height of the husband is above the average, then the average height of the array of wives sensibly exceeds the mean height of wives; and if the height of the husband is below the average, the average height of the array of wives is sensibly below the average height of wives. In other words, tall tends to marry tall and short to marry short."\* The popular notion of a negative correlation is thus nothing but a popular fallacy. There is a real positive correlation between husbands and wives, a correlation expressed by the coefficient .2872, which indicates a closer similarity between husband and wife than between uncle and niece so far as this trait is concerned.

I am painfully conscious of the fact that my remarks have simply grazed a subject of tremendous scope and importance, but I believe I have sufficiently explained my object in presenting the subject to your notice to render further apology unnecessary. For the, at least provisional, investigation of numerous problems, I hope I have shown you that very simple mathematical processes are sufficient. In your orthodontist work you are dealing, like the anthropologist and zoologist, with variable phenomena, and the application of these simpler modes of statistical treatment would undoubtedly aid you in the formulation and solution of not a few of your problems. Perhaps my foregoing remarks will serve to stimulate at least some among you to make this application.†

\*Pearson, *Loc. cit.*, p. 431.

†In addition to the works already quoted, I should like to refer to a recent textbook on the subject, viz., G. Udny Yule's *An Introduction to the Theory of Statistics*, London, Chas. Griffin and Co., 1911.

## FOOD DEFICIENCIES AS A FACTOR INFLUENCING THE CALCIFICATION AND FIXATION OF THE TEETH\*

BY MAJOR F. M. WELLS, F.R.S.M., C.A.D.C.

I MUST, in the first place, apologize to the Odontological Section of this Society and to the distinguished visitors who have honored us with their presence this evening, for having taken upon myself the task of introducing this subject. I can claim no special knowledge of these food deficiency products or so-called "vitamines." In fact I have only a very superficial and inadequate acquaintance with the various and varying theories that have been held on this subject.

The problem of food deficiency factors, or so-called "vitamines," has of late years received an increasing consideration, and there has been brought together from most different sources an abundance of facts which seem calculated to enrich our conception of the dietetic value of foods.

The investigations have revealed that satisfactory growth of nutrition can not be maintained upon a diet containing protein, fat, carbohydrate, salts and water, but that in addition certain other essential constituents are necessary, of which as yet, very little is known. These are known as accessory food factors, or "vitamines," and are present in a very small amount in most natural foods, and their chemical nature is unknown, but healthy life is impossible in their absence.

The diseases that are known to be produced by these accessory factors are beri-beri and scurvy, others which are believed to be caused by accessory factors, but of which the proof is incomplete, are rickets, sprue, and pellagra.

Before proceeding with the experimental part of the work done by Dr. Zilva and myself, I would like to give a short review of the work on scurvy and rickets, and a few of the many theories that have been advanced as to the cause of the rapid increase of tooth decay.

The etiology of beri-beri is well understood today, but as this disease is not endemic in this country and rarely occurs in infants, and so far as I know, it causes no dental disease, it is therefore not to our interest to discuss it here tonight.

Thrush or "sprue" is interesting to dentists, but as yet I know of no scientific work done on this disease.

Scurvy is not a new disease, as some people are led to believe. A description of scurvy is to be found in the narrative of the campaign of the Christian Army in Egypt under Louis IX, about the year 1260. The historian of that crusade was not only eye witness of the disease in others, but was himself attacked by it. He speaks of the debility and tendency to swoon, black spots on the legs, bleeding from the nose, and the livid and spongy condition of the gums, etc. The barbers used to go round trimming the gums of the sufferers.

Scurvy has unquestionably existed in the north of Europe from the most remote antiquity. That we have no mention of it in the early history of the

\*Read before the Royal Society of Medicine, London, Eng. Published with permission of Col. Clayton, Director of Dental Services for Canada.

Northern nations must be imputed to the ignorance of the people, especially as regards medicine.

Well-marked, so-called florid, scurvy among infants was not an uncommon occurrence about the period 1875-1900, when artificial feeding was popular and patent foods were enthusiastically adopted. At the present day it is probable that mild incipient scurvy is more common than is usually believed. This condition is solely due to the rapid increase of artificial feeding of infants.

Obscured though the exact etiology of infantile scurvy may be, it is probable from clinical facts that this affection arises from causes distinct from those that produce rickets.

Almost all that is known of the pathology of scurvy among infants is due to the investigations of Sir Thomas Barlow and Professor Still, of the Great Ormond Street Children's Hospital, London.

In adult scurvy we have conclusive proof that the prolonged deprivation of fresh vegetables or their equivalent, is certain to bring about a scorbutic condition. We are also sufficiently familiar with the fact that proprietary infant foods do not contain the accessory factors that are necessary to prevent scurvy. It has been demonstrated experimentally that these accessory factors which prevent scurvy are contained in human milk and in the milk of the cow, but not in large quantities, but they are destroyed by the process of heating to a degree depending on the time and temperature of heating. It is clear then, and fair to say, that the further we go from a natural food which is consumed in the raw condition, like the mother's milk, the more frequent will be the risk of the disease. Dried milk contains less of the antiscorbutic factor than raw milk.

The age at which we should be on the *qui vive* for the initial symptoms of scurvy is about the eighth month of infantile life. It is exceptional when the symptoms appear earlier. This point is of considerable importance in diagnosis.

Professor Still in his clinical picture of the fully developed disease is striking enough; an infant who has been fed upon one of the patent foods, with or without milk, or on milk which has been condensed, sterilized, or otherwise altered, has been ailing for some weeks, has taken food badly and probably lost weight. Moreover, the mother says it cries whenever it is touched, and, as she puts it, "has lost the use of its limbs." The infant is pale, it lies quiet perhaps until it is approached, when it cries out in obvious dread of being touched; the legs lie motionless, usually with the thighs slightly abducted and averted, and the knee slightly flexed; the arms are less often affected. There may be some swelling of part of one or other of the limbs, obliterating the natural curves. Any handling of the affected limbs causes a piteous cry, evidently of acute pain. If teeth are present, the gums around them are swollen and purple, occasionally projecting like a mass of granulations, almost completely hiding the teeth, and bleeding readily when touched.

The urine is perhaps smoky, if not red with blood. Such in outline is the characteristic picture of infantile scurvy.

Rickets is believed to be a disorder of nutrition, and as such, affects the whole system. The bone changes are only part of a general disease. The child may suffer severely and yet not show so slight a degree or rachitic change in the bones that the disease might almost pass unnoticed, if only the osseous system

was considered. The temperature is normal, even during the most active stage of the disease. A rise in temperature is almost always due to some complication. There is little to be said in favor of an infective origin. Rickets among children in the British Isles has grown to a very alarming state. From 50 per cent to 80 per cent in London clinics show signs of rickets to a more or less marked degree. It is found in the dominion to a less extent, but it is quite common.

#### SYMPTOMS

Delayed dentition is one of the most constant symptoms. It has been found in 32 out of 42 consecutive cases between nine months and three years old that this was present. Frequently no teeth have appeared at the end of the first year. Rarely their appearance is delayed beyond the period of eighteen months. If dentition has begun before the onset of rickets, it is often arrested for several months. There is a striking tendency to very early caries, even before the tooth is fully out, the enamel at the cutting edge is often completely destroyed. Among other symptoms is sweating of the head during sleep, large protuberant abdomen, reluctance or inability to stand, which makes the child late in learning to walk, the softness of the bones and ligaments, which makes the bones bend and the joints yield, with the resulting bandy-leg, knock-knee or other deformity, stooping curve of the spine, large size of the head and square shaped, with all the tendency to convulsive disorders and to catarrh of the respiratory and alimentary tract, adenoids, chest affections, indigestion, etc.

The most prominent symptoms, no doubt, are those that affect the bones, but in rickets there is a general disturbance of metabolism and its effects are not limited to any one tissue of the organism. Until a cure is made, the disease prevents satisfactory nutrition of the bones and teeth, stunts and deforms the bones of the face and jaws, etc., and the damaging results are carried by the patient through the whole of his life, even after a cure is effected.

This great affliction, which appears to become more common every day, if not altogether prevented, can easily be remedied, if the baby is started off on a proper diet, which is the mother's milk and which every baby needs. If the conditions are such that the baby is prevented from getting its proper diet and has to be artificially fed, too much care can not be exercised in watching its progress for the first eighteen months, especially in regard to the weight of the infant.

The early stages of scurvy and rickets are almost impossible to diagnose and a baby that has to be fed on an artificial diet should never be allowed the use of a teat or "dummy," as the diseased condition of the bones, caused by the absence of the food deficiency products, with constant suction of a "dummy," will rapidly caused badly developed jaws and nose, followed by adenoids, nasal obstruction, irregular articulation of the teeth, mouth breathing and the whole train of evils to which this condition gives rise.

It is important that a baby's weight be kept normal. Rickety babies usually appear to be fat. If the disease is to be checked before serious harm is done to the child, the early signs must be recognized as soon as possible.

The first symptoms point to *pain from teething*. (Painful teething in children is just as much a disease as any other baby ailment.)

The second symptom is *late dentition*. (Every baby should have at least two

teeth between the sixth and seventh month). If the child shows these signs, rickets should be suspected.

It is amazing that these evils are known to exist, and it has been pointed out that they are due solely to improper diet, and yet medical men will allow mothers, who are quite capable of suckling their infants, to feed them on artificial foods and so deprive the infant of its heritage. Perhaps the fault lies in not having direct scientific evidence to show that a faulty diet is the direct cause of improper fixation and calcification of the hard tissue.

Now we will take up some of the most important theories that have been advanced during the past fifty years, as to what is the cause of the rapid increase of tooth decay. Miller's *Chemico-Parasitic Theory*, which accounts for the phenomena of caries of the teeth, does not explain the rapid progress made in the increase of dental caries accompanying civilization in the past hundred years. In view of the fact that the incidence of dental caries has been greatly on the increase, especially in the last fifty years, it would seem obvious that our present mode of treatment of dental caries was radically wrong, that the judgment of time and experience alike condemned it, and that such measures as are now in vogue have proved futile to arrest the progress of what has become the most prevalent disease of civilized communities.

#### HEREDITY

Professor Darwin, in his address to the British Association in 1909, set forth some of the difficulties which exist in accepting either the theory of pangenesis or that of the continuity of the germ plasma as an explanation of heredity. I have no intention, for I have not the necessary knowledge, to express an opinion on heredity. The only information that is at our disposal in regard to this theory, are statistics of family history, which appear to throw very little light on the subject.

Chemical analysis of our teeth has yielded us, so far, little or no information, and biochemistry is, as yet, still in its infancy.

To what extent do "vitamines" affect the enamel? We do not, at present, know how far differences in their action may modify the rest of the tooth, but the connection which appears to exist between the enamel and the odontoblastic cells is direct, if this is not so I should call it an "inborn error of metabolism." I know that I am going to be severely criticized by my friend Dr. Mummery, and very generally by all of the leading dental anatomists, who state, as I understand it, that when the enamel is once formed it is formed for good, but strong reasons have adduced me that this belief is not based on such sure grounds as is generally supposed.

I made a trip to Scotland last month with a view to studying the diet conditions in the Highlands and Lowlands. I have always been led to believe that the Highland Scotch had better bones than are to be found in any part of the British Isles, and I thoroughly believe they have. This is largely accounted for by their simple diet of natural foods. Up to a few years ago the Highlanders' meals were very simple. Their breakfast consisted of brose at 6 A.M. Brose is made by pouring boiling water over oatmeal, stirring all the time and adding a little salt. It was eaten with milk, syrup or treacle, and some had butter with it. The

next meal was between 11 and 12 o'clock, which consisted of potatoes and salt herring. No bread was eaten, but for the second course a bowl of milk and a piece of oatcake was taken. This was a universal dinner all through the North. The next meal was about 6 P.M.; again brose, but as a variation it was made with boiling milk instead of boiling water. Between the mid-day meal and supper they had a glass of milk, and in later years tea came in. The only variation from this diet was on Sundays. Breakfast was usually later and dinner, which consisted of boiled cabbage and turnips, was served after church. For supper on Sunday they had boiled potatoes and fresh fish and sometimes pork, but the pork was very sparingly used, as one pig had to last a family for the whole of the winter. Beef was rarely eaten.

Rickets is not known by Dr. Bremner, of the Department of Public Health for the County of Sutherland. He told me there has not been a case in his district. He also stated that the percentage of artificial feeding of infants was practically nil. A mother looked upon it as a disgrace if she was unable to feed her child, and it is only recently there has been a small percentage in the coast towns where the women are compelled to hawk their fish and render other duties which make it impossible for them to breast-feed their children, but away from the coast there is practically no artificial feeding.

A remarkable thing among the old type of fishermen today is that there is hardly any decay in the teeth of men of seventy to eighty years of age, but the young generation has quite a considerable number of decayed teeth.

The following is a little incident which I would like to relate. I happened to call on a very intelligent old lady, eighty-one years of age, and after a short conversation with her relating to the subject of my trip, she immediately told me that the curse of the Highland Scotch today was tea. All the crofters, or poor farmers, keep the teapot going from morning until night and are sipping tea all day long. I remarked that she had a very good set of teeth and she told me, in her broad Scotch, that she had lost one tooth through an accident and that she had never had a toothbrush in the house. I might state here that a toothbrush was hardly ever known among the last generation of the Highland Scotch. However, I will refer to the toothbrush and its uses later.

Dr. Bremner, of the Department of Public Health for Sutherland, gave me a lot of valuable information in regard to his examination of the men for the Army and Navy, from his district. He found that all of the men over twenty years of age and up to forty-five had exceptionally good teeth, as they advanced in years their teeth showed wear but no decay, but there was a vast difference in the teeth of the men under 20 years of age. I asked him what he thought it was due to and he said he thought it was due to nothing else except the rapid change in the diet. He also stated that there is an increase in tuberculosis, due to the same cause. The crofters, or poor farmers, are taking to artificial foods and discarding the natural foods. The oatmeal and potatoes are being exchanged with the grocers for white bread, jam, syrup and tea. These are all less valuable foods as regards content of accessory factors. I was told by one public health officer in the Highlands of Scotland that there are a great many families at the present time that make two meals a day off bread and jam or treacle and their mid-day meal consists of potatoes and fish and this class have become inveterate tea drinkers.

What a different condition presents itself in the Lowlands. I found in the Clyde district a different type of Scotchman altogether. The great reason for this is, to my mind, the diet of more refined foods. The people are better housed and sanitary conditions are better than in the North. Rickets and scurvy in the infant are as bad in this district as in any part of the British Isles and they have left their mark on the older generation. Nearly every person is wearing false teeth or presents a row of decayed teeth when he opens his mouth.

#### THE USE OF THE TOOTH BRUSH AND ANTISEPTICS IN THE MOUTH

Has oral prophylaxis been a success as a preventive against tooth decay? Our great army of dentists and teachers all over the civilized world are recommending the diligent use of the toothbrush. One dentist that I know conceived the idea that he could prevent his patients' teeth from decaying altogether by oral prophylactic measures. His method was to have his patients come to his office as often as he thought desirable, once a week or once in two weeks, etc., and thoroughly cleanse all the interproximal spaces. This kind of practice did not last long, as the cavities were multiplying so rapidly that he had to either send his patients to another dentist or return to his general practice. He decided on taking no chance of losing his patients, so he went back to general practice.

No, I do not believe the toothbrush ever prevents tooth decay. If the enamel will not resist the action of the fluids of the mouth, the toothbrush will not prevent the onset of decay on the surface of the teeth or in the interproximal spaces. It has been found that mouths that are immune to decay have very often a greater number of fermentative bacteria than the mouths of patients where decay is rampant. The plain fact is, that the toothbrush is a dangerous germ-ridden instrument, which it is impossible to sterilize. It can not be boiled and we have no disinfectant which would render it aseptic and not leave it unfit for further use. On my way back from Jena to Canada, in 1904, I called on my old friend, Mr. Gilmour, in Liverpool, and was telling him about some experiments that I had made during the summer with different tooth pastes and washes that are in general use. I showed him my results and told him how short a period the antiseptic properties of these washes would last and the increased growth of bacteria over the normal within a few hours' time, due to the destructive effect on the delicate mucous membrane of the mouth, causing an impaired condition of the natural resistance and thereby intensifying the growth of bacteria. In no case did the antiseptic action last over fifteen minutes. He then told me that he had been watching the results of different patients of his, that he could rely on as being very careful to cleanse the mouth out regularly, and that frequently they had an increased amount of work to be done over the previous year. On turning up his records I found some of his patients he was referring to were using the same pastes and washes with which I had experimented.

For our own comfort we have to keep the toothbrush going, but it is not going to prevent tooth decay. Tartar has never decayed teeth, but in lots of cases it has, I believe, saved them from decay. If you gather records of conditions of the teeth extending over a large area, you will find the least decay always where the toothbrush is not in use and this has been my experience all over.



We have, therefore, to look to some other source to find the true cause of tooth decay, and I think it can usually be traced to the improper diet of the child in infancy.

*Antiseptic Washes.*—The conception which prevails generally among medical and dental practitioners in regard to the use of antiseptic washes in the throat and mouth, is singularly confusing and confused. It is credited by them with consistent and often contradictory attributes, so great is the lack of clearness and precision of scientific work on this subject, when it approaches this topic, which has so weighty a bearing on our daily work. I began to despair of ever being able to get an antiseptic wash that we would be able to use on such a delicate structure as the mucous membrane of the mouth and throat, but through the work on flavine of Dr. Browning of the Bland-Sutton Institute we have now a wash that will not only act as a good antiseptic, without causing irritation, but its retentive powers are such that it keeps the bacterial flora down for hours, instead of a few minutes.

#### EXPERIMENTAL

This report is based upon histologic work carried out on the teeth and jaws obtained from considerably over 100 animals.

*Method of Investigation.*—For the purpose of this inquiry the lower incisor and molar teeth of the guinea pig were chosen. As in all rodents, these teeth grow from persistent pulp and are never shed. The teeth, while still *in situ* in the lower jaw, were decalcified and sections made in an anteroposterior direction, parallel to the long axis. In advanced cases of scurvy the teeth were apparently sound, but useless, inasmuch as they had been loosened by the gradual absorption of the cement membrane of the alveolar sockets, which had left exposed that portion below the neck. As a result there must have occurred that peculiar periostitic pain or something analogous which follows in the case of human patients who are suffering from shrunk alveoli. These teeth also presented, in addition, all the appearance of the changes of senility. A great number of longitudinal and transverse sections suitable for microscopic examination were obtained. The revelations offered by these sections are of a particularly interesting nature. Note the fine line of the dentine and odontoblastic cells as compared with Figs. 3 and 4.

Figs. 1 and 2 are of a normal tooth and give one the opportunity of studying the histology and pathohistology of the dental pulp in its normal relationship to dentine. The enamel is not quite as heavy as in the natural tooth on account of the decalcifying process which has reduced it to about half its thickness, but it gives one an excellent example of the typical appearance of the relationship to the dentine of the blood vessels, the fine cellular tissue and odontoblastic cells when in a normal condition.

Figs. 3 and 4. It is obvious that the term "Fibrosis" or fibroid degeneration, is the only one which can with certainty be applied to this particular form under notice. There is no doubt that it is a specimen of degeneration and it is equally easy to eliminate those other degenerative varieties, such as mucous, calcareous or fatty, which animal tissues may undergo.

The present instance affords an opportunity of examining certain structural **metamorphoses** in the pulp which are believed not to be dependent on any inflammatory condition, but simply attendant on and produced by altered metabolism of constitutional changes due to the diets.

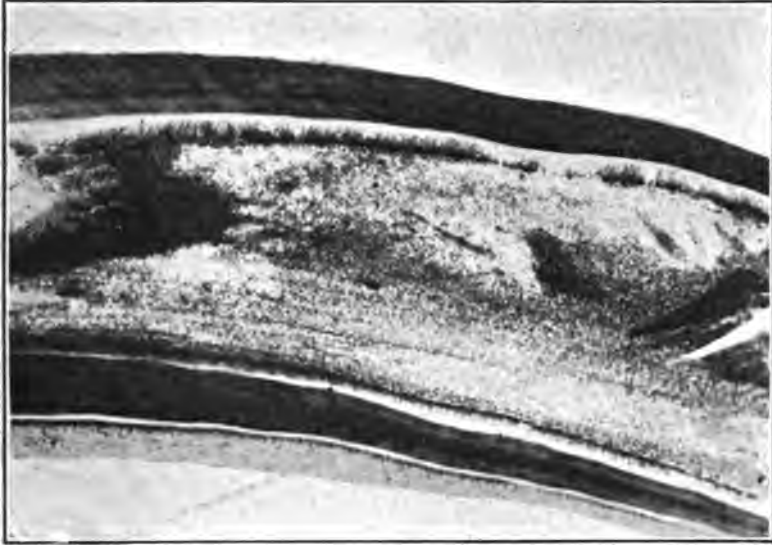


Fig. 1.—Normal guinea pig tooth 40 X.



Fig. 2.—Same as Fig. 1 but 200 X.

Minute descriptions have been published on pulp nodules, calcareous pulps and elaborate work on ulcers and tumors connected therewith, but this affection seems to have been unknown or overlooked by the pathologists both in Europe and America. In no case does one find the condition as depicted in Fig. 2

brought about by a dietetic experiment. It is evident in this picture that in complete pulpar fibrosis no cellular elements of any description occurred. It is clear at once, and it is an important fact, that no trace of cellular organization, no trace of cell nucleus, no trace of interstitial cement substances can be found anywhere. Nerves, cells, blood vessels and odontoblasts have all shared the proc-



Fig. 3.—Scorbutic condition of guinea pig tooth as shown 15 days on scorbutic diet 40 X.

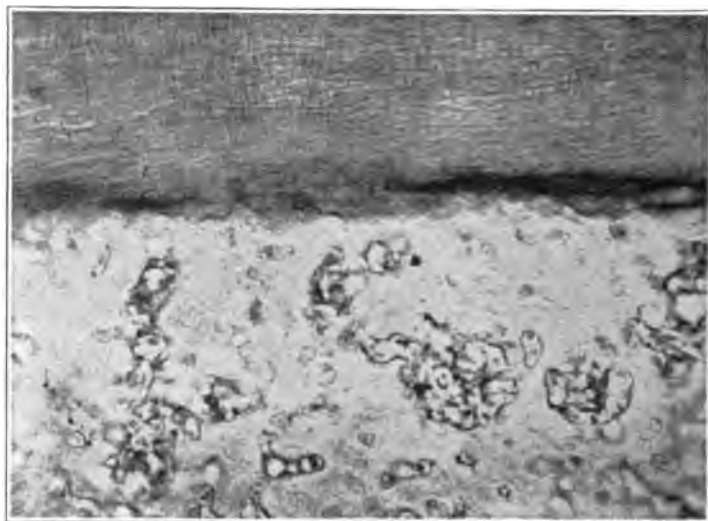


Fig. 4.—Same as Fig. 3 but 200 X.

ess of fibrification and are no longer recognizable. The fine cellular connective tissue, which is but a loose mass of network in the normal state, has either become grossly hypertrophied or quite obliterated and its place taken by a new, firm, fibrous structure, devoid of cells, nuclei, or any regular arrangement of constituted parts.

Figs. 3 and 4 show an advanced state of scurvy. The irregular osteroid condition of the dentine is well marked and the different refractive appearance of the dentine is probably due to the hemorrhagic condition of the dentinal fibrils.

In a scurvy tooth the condition persists right up to the apex of the root; the trouble at first appears to start in the odontoblastic cells at the top of the pulp, working toward the apex, followed by distended blood vessels and hemorrhage, then complete fibroid degeneration follows.

With the object of obtaining some insight into the condition of the teeth of pregnant guinea pigs, I placed eight pigs which were in a more or less advanced state of pregnancy, on a scorbutic diet, to study the biological relation existing between the mother and offspring. Two of the guinea pigs that were used for this experiment were in the early stages of pregnancy, the remaining six being at an advanced state. The diet given, in each case, consisted of autoclaved milk, oats and bran. The pigs which were in the early stages of pregnancy died on the 11th and 13th days respectively, and death from intestinal infection was suspected.

Microscopic sections were made of the teeth of the mother and offspring of the hemorrhagic condition and the very early stage of pregnancy, nothing could be discovered.

The six pigs that were in an advanced state of pregnancy all dropped their young at various stages of the experiments, from 11 to 15 days.

Microscopic sections were made of the teeth of the mother and offspring and in every case an advanced state of scurvy could be seen. No. 5 will indicate the condition of mother and No. 6 the condition of offspring, which are typical of results obtained throughout the experimental work which was afterwards carried on by Dr. Zilva and myself. It is not necessary to discuss the remaining cases of this group, as they all exhibited similar symptoms.

This work has to be carried out more extensively, as it is a little premature to make a positive statement, but the indications lead me to believe that the pigs during pregnancy, are more susceptible to scurvy than when in a normal condition.

For the past four months I have been working on rickets, but my great difficulty has been to obtain material for histologic work.

Advanced cases of rickets are not so common now as they were from 1890 to 1895, when artificial feeding of infants was at its height, and when less was known of the contents of artificial foods.

Today if a child enters a hospital and rickets is diagnosed, a cure is brought about in a very short time, consequently material to be had from infants for histologic work is very rare indeed.

Mr. Sidney Spokes kindly gave me some old specimens and from these I made a great many sections, which lead me to believe there is a great change taking place in the enamel organ. These sections are not sufficiently clear for me to exhibit, as the material is very old and the sections I made are very poor, but the results are sufficient to show that the enamel cells are greatly deranged from the jaw of a child eight to nine months old. Mr. Spokes has kindly lent me his sections which he made from the same specimen when he first obtained it a few years ago and which is exhibit No. 9.

This work is to be further developed and I expect within a very short time to have a considerable amount of material with which to work.

The teeth were all decalcified in a solution containing 40 per cent formaldehyde, 30 per cent formic acid and 20 per cent distilled water. This is rather a slow process, but I found it gave better results than the more rapid method. The rapid method which I used was to decalcify with phloroglucin and nitric acid. This process will give very quick results but is not so efficient as the slower method. After the decalcification was complete, sections were cut by freezing in gum and then staining with Ehrlich's acid hemotoxylin and eosin.

Throughout the whole of the experimental work the earliest alteration to be noticed first takes place in the odontoblastic cells, in the upper part of the pulp, working gradually down to the apex, followed by dilatation of the blood vessels and hemorrhage.

#### CONCLUSIONS

That scurvy does affect the pulp is indisputable and is not a theory but an absolute fact, a doctrine in a true sense.

Records that have been made of patient's mouths during the eruption of the second dentition, in regard to the decay of the teeth, must be very unreliable. How many in this room could give a proper record of their diet even for three days if asked to do so? I venture to say there are very few who could state everything they had eaten for three days, or twelve meals, including tea.

The dentists who are working in infant and children's hospitals are the most fortunately placed to get reliable information for records that would be of great assistance in studying the development of the first dentition from a dietetic view. But this work, like all other medical research, has to be carried on in animal life, if scientific results are to be obtained, and work that is carried on with animals that are always kept in cages and carefully watched and given a certain diet, is bound to give a definite result, if the experiment is repeated often enough. We have used considerably over 100 animals in this experiment.

I am obliged to confess that twelve years ago when I published my first article on the effect of artificial light on infants in regard to the calcification of the teeth, I certainly thought that it played a much more important part than the diet. It was while I was arranging my work to carry on my research still further with the artificial light that I was attracted by the work that was being done in the Lister Institute on scurvy. After having examined the teeth of several animals that had been given a scorbutic diet, I found the pulp of the teeth was affected, even before any clinical symptom appeared in any other part of the system. This led Dr. Harden, Dr. Zilva, and myself to believe that it was more important to go on with the dietetic experimental work than the artificial light.

To Dr. P. P. Laidlaw of Guy's Hospital, I wish to express my gratitude for much useful advice and help in the histologic work, and to Mr. F. Martin Duncan for the pains and skill taken with the photomicrographs.

## A CONSIDERATION OF FREQUENT CAUSES OF MAL-OCCLUSION

BY WILLIAM B. POWER, D.D.S., SEATTLE, WASH.

**I**N a paper which I read before the King County Dental Society April 2, 1918, published in the August issue of the JOURNAL of the same year, I took up in a general way some of the most frequent causes of malocclusion, as I observed them in my own practice. The publication of that paper caused some little discussion by men who read it, and to further substantiate some of the conditions which I have mentioned, I am writing this paper, illustrated with a number of malocclusions which I believe present positive etiologic factors that are so clear that they can not be misinterpreted for anything else.

Under the head of constitutional conditions, I stated "rickets" was a disease that was very liable to cause malocclusion and which produced typical conditions that could be very easily recognized in most cases. Rickets is a disease which may manifest itself at any time in the life of the individual, the malocclusion will present certain characteristics depending upon what time the child acquires the disease. One of the earliest symptoms of rickets is that the deciduous teeth are lost early and the permanent teeth erupt late. Given such a clinical history in any case, malocclusion is always sure to develop, and when the two conditions go together, complicated by the constitutional disturbance as found in rickets, malocclusion of the most severe type is very liable to occur. With



Fig. 1.—A condition resulting from rickets.



Fig. 2.—Shows superior arch of same case as in Fig. 1.

children that have the disease only to a limited extent, the malocclusion is characterized by a lack of development of the upper arch with more or less bunching of the upper anterior teeth and a tendency for the overdevelopment of the lower arch. Fig. 1 shows such a case. Fig. 2 shows the occlusal view of the upper dental arch in which will be noticed the large well-developed rugæ of the palate which also is associated with rickets. The alveolar process is thick and spongy and the alveolar ridge is thick and the teeth will move quite easily. The tardy eruption of the teeth from any cause will, of course, produce a maloc-

clusion, but in the majority of those cases where this tardy eruption occurs, rickets will probably be present. Fig. 3A shows the front view of the case in which there is a spacing between the central incisors that has been produced by the abnormal development of the frenum, but this spacing is further augmented by the fact that the upper lateral incisors are unerupted and are really late in erupting. Owing to the lack of approximal contact, the action of the lip and the abnormal frenum, the upper central incisors have drifted apart, and taken a lingual position. The whole case is one which will present a very complicated condition and one which will grow worse as the individual grows older. It is another case which demands immediate treatment and is one which by no means should be allowed to wait, neither should the parents be told the case can be treated a little later as easily as it can now. Fig. 3B shows the result that has been accomplished by treatment, and could be more easily obtained at that time than



Fig. 3.—A. This shows superior centrals in lingual occlusion, with right lateral unerupted. B. A result in same case easily obtained.



Fig. 4.—Anterior teeth in wrong position due to interlocking of inclined planes of teeth.

it could ever be obtained at any later period in the individual's life. I am showing this case not only as a possible factor of etiologic interest, but also one which emphasizes the importance of treating certain types of malocclusion immediately and to discourage the idea of telling patients to wait.

In the study of normal occlusion, we have been told that the force of the inclined plane was one of the factors which caused teeth to assume and maintain their proper position in the line of occlusion. Now the force of the inclined plane is active and normally produces normal occlusion but when for any reasons the force becomes abnormal it will cause the malocclusion to become more extreme as the individual advances in age. The model on the left of Fig. 4 shows a case in which the abnormal locking of the inclined plane of the central incisor, as well as the abnormal approximal compact in both the upper and lower teeth are producing a type of malocclusion which will grow worse the older the individual becomes. In other words, the incisors are so locked that malocclusion is the only thing that can possibly exist and is the only development which will

occur following the subsequent eruption of the other teeth. We might say the entire treatment of this case lies in getting the two forces of occlusion that are abnormal to act properly, namely, the force of the inclined plane and approximal compact. If these forces are corrected and continue to act as they should, the malocclusion, of course, will be necessarily corrected and normal development will progress from this point.

The loss of any deciduous teeth will produce malocclusion, and when given a certain deciduous tooth that is lost, we can absolutely portray the future malocclusion that will develop. The loss of a deciduous tooth produces malocclusion in at least two ways, first, by destroying and interfering with the mastication of the teeth which in turn disturbs the mechanical stimulation of the supporting structures. Secondly, the loss of the tooth interferes with approximal contact which in turn allows the dental arch to collapse and that in turn produces in-harmony in the size of the arches, which has an influence on the opposing arch and eventually destroys the force of the inclined plane. In Fig. 5 we have the loss of the lower right canine and the lateral incisor has drifted lingually and



Fig. 5.—A condition resulting from the loss of the lower right deciduous cuspid.



Fig. 6.—Superior central deflected into malposition.

to the right until it is in contact with the first deciduous molar. The result of this is the lower arch is smaller by the width of one tooth which has resulted in the bunching of the upper arch, and which will result in the impaction of the lower canine or the premolar, depending upon which of those teeth attempt to erupt last. The only treatment for this case is to restore the normal sizes of the upper and lower arch and make the proper space for the permanent teeth in the lower arch so they can come in and occupy the normal approximal contact. This is another case in which it was very unwise to delay the treatment because of the condition that will simply be postponed from one tooth to the other as each succeeding tooth erupts, even though the malocclusion does not become apparent in early life. We see a large number of these cases in which the parent failed to realize that one tooth was short in the lower arch and they come to us to have only the upper arch straightened because that is the only one which to them shows any malocclusion. We have even known dentists who are so unfamiliar with the dental anatomy as to overlook the missing tooth in the lower arch until their attention was called to it.



In order to more thoroughly show the force of the inclined plane as a factor in producing normal occlusion or malocclusion, I am showing Fig. 6 which was another simple case but the whole etiologic features lie in the fact that the upper central incisor has become deflected and from now on will continue to occupy a malposed position, unless the mechanical interference is instituted to correct it.

We have mentioned the fact that the early loss of the deciduous teeth is an etiologic factor in the production of malocclusion, but it must also be remembered that the prolonged retention of the deciduous tooth or even the retention of a small portion of a deciduous tooth will produce various types of malocclusion. In Fig. 7 we find the upper central incisors wedged between the centrals and laterals, and the deciduous root is still in position. The position of the upper central is without question the result of force of inclined plane, during the time it erupted against the retained deciduous root. As a prophylactic measure in the prevention of malocclusion it is very imperative that the child's mouth be examined at various intervals and the deciduous roots be extracted



Fig. 7.—Superior central wedged crosswise between lower central and lateral. Deciduous roots still in place.



Fig. 8.—The removal of the frenum labium and a small amount of treatment obtained a satisfactory result in this case.

so as to avoid such conditions as are shown in Fig. 7. As to the possible time when a deciduous root should be extracted so as not to produce a malposition of the permanent teeth, that can only be decided by frequent study of the conditions after the teeth have been radiographed.

In the majority of those cases where all the upper teeth are in normal approximal contact, and we find a large space between the central incisors, this spacing is generally the result of the abnormal development of the frenum-labium. The exact cause of the development of the frenum or abnormal size of the frenum is still a disputed point and in some type of the maldevelopment the most logic treatment beyond the question of a doubt, is the surgical removal of the frenum and then the drawing of the incisors together. Fig. 8 shows such a case before the removal of the frenum and also the same case after the frenum was removed and the central incisors brought into position. It must be remembered that every case of the separation of the upper central incisors is not an abnormal frenum case, and consequently the condition must be very carefully

observed, before making a prognosis as to the outcome of the case or also a diagnosis as to the etiologic factors involved.

Another common type of malocclusion or rather another common condition which will produce malocclusion is supernumerary teeth. Supernumerary teeth may make quite a spectacular malocclusion, but as a rule such malocclusions are comparatively easily treated by the removal of the supernumerary teeth and the bringing of the normal teeth into occlusion. I wish to say that missing teeth are also factors in the production of malocclusion, but of the two, supernumerary teeth are much more easily treated from the standpoint of permanency, because all the tooth material is present that is necessary to produce the normal



Fig. 9.—A very unsightly form of malocclusion caused by a supernumerary tooth.



Fig. 10.—The growth spaces are easily seen, with the lower centrals erupting in a lingual position. Teeth thus erupting are often mistaken for malocclusion.



Fig. 11-A.—A frenum labium case.



Fig. 11-B.—The abnormally large frenum labium was removed in this case. No appliance was used to move the teeth which were widely apart, yet this was the result at the end of two years.

occlusion. In cases produced by missing teeth the tooth material is lost and it consequently follows that in the correction of the malocclusion present the result is never entirely satisfactory, owing to the missing tooth material, which makes the attaining of normal occlusion or normal masticating efficiency impossible. Therefore, I would say that of the two evils, the case produced by the supernumerary tooth lends itself to more satisfactory treatment than the case produced by the missing tooth.

In considering the causes of the malocclusion, it is very necessary to take into consideration the age of the patient, for in some instances a malposition at

a certain age may be corrected by a normal growth, associated with normal forces of occlusion; provided all forces of occlusion are normal. In Fig. 10 is shown the upper arch of a child in which spaces are seen to be present between the deciduous incisors which indicate the upper arch is developing to accommodate the permanent teeth. However, for some reason or other in this particular individual, the growth was not rapid enough to accommodate the eruption of the lower permanent teeth, and we find the lower central incisors occupy a slight position of linguoversion. Some of these cases demand treatment, while others when present in children that are assuming an active period of growth, will be carried out to the proper position by the normal tongue action. If a child is a normal breather with normal lip and tongue action and the proper physical development at that time, the natural forces of occlusion and natural



Fig. 12.—As the occlusion should be.

growth may overcome the slight deficiency shown in Fig. 10. However, with a slight malocclusion occurring we may just have the reverse, in which case the growth will stop at this point, Fig. 10, nothing will be carried any further, and the mechanical interference will have to be instigated to produce the development that nature has failed to get up to this time. The question of the treatment of such cases as shown in Fig. 10 is one which has to be very carefully considered and the child kept under close observation in order to see whether the normal development is going to take place, or whether mechanical interference must be started to supply what nature has failed to do up to this time.

Fig. 11 also shows a very interesting case but you will have to take my word for the condition, as this case was one in which an abnormally large frenum was removed. No appliance was used to move the teeth together, which were very wide apart, still the results as shown in this model occurred at the end of two years. I am showing this case to substantiate the fact that some man claimed that abnormal frenums are not etiologic factors and that the removal of them does no particular good. From clinical observation I am convinced that the spacing between the teeth as originally present was the result of the abnormal frenum and after the frenum was removed the etiologic factors

were gone, and nature was able to care for the rest by establishing normal forces of occlusion.

I might further say that any type of malocclusion which develops is the result of the forces of occlusion going wrong, and if all the forces of occlusion act normally there is a normal occlusion as shown in Fig. 12, which is the ideal for every type of malocclusion treated.

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## TEACHING ORTHODONTIA\*

By W. E. STOLT, D.D.S., OMAHA, NEBR.

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THE teaching of orthodontia is a difficult proposition, especially in the dental college, where it is presented with the idea that the course is not expected to fit the student to practice this branch of dentistry with any degree of success and only gives him the theory which he may or may not retain after he passes the final written examination of the college and the state board, and which then, will have to be worked out in practice attended by the usual difficulties, incident to initial attempts at the correcting of malocclusion. That student-dentist is an exception, who succeeds in spite of these conditions and the percentage is indeed small. There being a number of teachers in the alumni association and probably some among the present graduation class, I offer these suggestions.

Since there is so much malocclusion to be corrected, I believe we should endeavor to give the students under us as much practical knowledge as we possibly can.

The following, I offer mainly because I believe many colleges are not giving orthodontia the attention that Creighton gives. The junior class gets the usual thirty-two weeks of lectures during the year, while the seniors are handled a little differently.

Each senior is required to handle one case all through the year, the clinic being ample for this. Besides treating this practical case he is required to write a paper on it and read it before the class, during the regular lecture period: the schedule for these papers being so arranged that the student has had time to get a working knowledge of his case and, too, that each will have time to prepare well. I usually have two papers each period and that allows us a little time for general discussion and "fill-in" explanations by the lecturer. This gives the entire class a good insight into all the orthodontia cases, widening their scope of experience, etc.

The system used to prepare the students to handle their cases and which helps them materially in writing their papers was suggested to me by Dr. Brady and consists of three diagrams illustrating, on the first, the malpositions of the teeth being drawn with black ink and over this the correct positions in red ink.

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\*Read before the Alumni of the International School of Orthodontia, Kansas City, Mo., July 9, 1918.

On diagram No. 2, which is a carbon copy of the malposition as shown on Diagram 1, I draw the appliances to be used; on diagram No. 3, I draw over the carbon copy of the correct positions as shown on Diagram 1, the retaining appliances.

All this, of course, takes time and is only successful when studied and understood by the student, so insisting on a careful study by the student is important.

This eliminates that terrible condition of misunderstanding and misapplication by students who forget what you have told them about the case the minute your back is turned and, taken all together, is a time saver.

I have found in my five years' experience that the hardest thing to overcome is the student's estimate of the importance of orthodontia, so I hail with delight the fact that I now have two years of blood test figures before and after the treatments to show how the correction of malocclusion in one hundred per cent of cases raises the red cell count. In some cases there has been an increase of over one million red cells and this increase seems to correspond to the

#### ORTHODONTIA CASES—RED CELL COUNT—1916-17—1917-18

PATIENTS	SEX	AGE	BEGINNING	CORRECTED
1. Helen M.	F.	16	3,392,000—	4,560,000
2. Catherine M.	F.	13	3,632,000—	4,600,000
3. Gladys C.	F.	12	3,680,000—	4,896,000
4. Dorothy H.	F.	15	3,808,000—	4,784,000
5. Raymond G.	M.	12	3,888,000—	4,768,000
6. Beatrice C.	F.	14	3,904,000—	4,512,000
7. Elizabeth N.	F.	13	4,064,000—	4,848,000
8. Foster C.	M.	14	4,080,000—	5,040,000
9. Frank F.	M.	11	4,144,000—	5,120,000
10. Waldron G.	M.	15	4,400,000—	4,624,000
11. Gayle W.	F.	11	4,608,000—	5,024,000
12. Thos. D.	M.	15	4,512,000—	5,040,000
13. Esther C.	F.	13	4,720,000—	4,800,000
14. Helen S.	F.	13	4,736,000—	5,072,000
			57,568,000—	67,688,000
FOURTEEN PATIENTS' AVERAGE =			4,112,000—	4,834,857
15. Tom M.*	M.	12	4,080,000—	3,904,000
16. Roy A.†	M.	16	3,520,000—	
17. Tom C.†	M.	13	3,712,000—	
18. Josephine A.†	F.	14	3,824,000—	
19. Robert W.†	M.	8	4,000,000—	
20. Catherine M.‡	F.	14	4,800,000—	
			81,504,000—	
TWENTY PATIENTS' AVERAGE =			4,075,200—	

\*Occlusion disturbed in the process of correcting—not so good as when started.

†These cases started but failed to finish.

‡Malocclusion only slight, no final count.

amount of occlusal surface contact increase. This has a wholesome effect upon the students and stimulates interest in orthodontia.

The jubilee is coming for orthodontia, so I hope no one will become discouraged because it is yet a little ways removed. I don't claim to have cleared up all the difficulties incident to teaching this subject, but I hope only to have offered a suggestion or two worthy of consideration and modified application.

SECOND YEAR'S TEST  
ORTHODONTIA CASES—RED CELL COUNT—1917-1918

PATIENT	SEX	AGE	BEGINNING	CORRECTED
Lois S.	F.	13	3,296,000—	4,640,000
Helen H.	F.	14	3,920,000—	4,720,000
Everett H.	M.	11	4,000,000—	5,008,000
Helen E.	F.	12	4,080,000—	5,120,000
Dorothy R.	F.	11	4,128,000—	4,640,000
Minnie S.	F.	15	4,144,000—	4,880,000
Francis N.	M.	11	4,352,000—	5,168,000
Esther R.	F.	14	4,384,000—	5,008,000
Vera B.	F.	15	4,880,000—	5,040,000
Alma A.	F.	15	5,040,000—	5,360,000
Gertrude G.	F.	16	5,088,000—	5,184,000
Corine A.*	F.	12	4,222,000—	4,168,000
Barney R.*	M.	9	4,928,000—	4,768,000
			56,462,000—	63,704,000
THIRTEEN PATIENTS' AVERAGE =			4,343,231—	4,900,307

\*In these two cases the occlusal surface contact was decreased in the process of treatment.

## HISTORY OF ORTHODONTIA

(Continued from page 128, Vol. V)

BY BERNHARD WOLF WEINBERGER, D.D.S., NEW YORK CITY

**F** E. HOWARD before the Seventh and Eighth District Dental Society presented a paper entitled *Irregularities of the Teeth and Their Treatment*. (*Independent Practitioner*, 1886, page 359.)

"A modification of the Coffin system will be useful in many different ways; for instance, if the arch is to be expanded in the main, a spring bent in the general form of a *W* is arranged in position about midway of the plate, and when vulcanized the plate is sawed through the center, the spring slightly opened, and the plate placed in position. From time to time this is spread as the case requires.

"When the anterior portion of the arch is to be spread, a hinge made of two eyes and a bar, joined and vulcanized into the posterior portion of the plate will hold the posterior part, while the spring will act upon the anterior part alone, or this may be reversed and the back teeth spread at the will of the operator, as the case may require.

"Instead of a hinge a more simple method will sometimes answer as well. Drill two holes in the back of the plate, and with a strong silk ligature or platinum wire bind the parts together, and this will hold them from spreading at this point.

"A piano-wire spring, vulcanized into the plate, is also very effectual for moving a tooth out when it is inclined in the mouth and it is not desirable to use a jackcrew. For the movement of canines and bicuspid, a band of platinum with a projecting top or knob cemented to the tooth, is admirable to retain the rubber or silk ligature in position, and to draw the tooth in its proper course, the ligature being attached to some point on the plate, or to a hook attached to some tooth not likely to change position by the force exerted.

"For the rotary movement of a tooth, a band of platinum with an arm attached and cemented to the tooth is a powerful agent for twisting such a tooth into position. Also a good and simple method for this movement, as applied to the four anterior teeth, is accomplished by tying a waxed silk thread to any of them, taking two or three turns around the tooth and attaching to a rubber ligature fastened at some convenient point in the plate. The force exerted is in a direction to unwind the ligature from the tooth, and thus it is turned in its socket."

*B. S. Byrnes* under *Correcting Irregularities by the "Spring" of Gold Bands*, introduces several novel methods in orthodontic procedure as illustrated in the *Cosmos*, 1886, page 278.

"In correcting irregularities of the teeth I have employed in a large number of cases a new device of my own invention which seems to possess many decided advantages over the methods in common use. A brief oral description presented to the last meeting of the Southern Dental Association, held at New Orleans, was so favorably received that it has seemed desirable to communicate the method to the profession at large.

"The motive power employed is the 'spring' or elastic force of thin gold bands. My preference is gold of 20 carat to 22 carat fine, and as a rule the thinner the bands the better the result. It frequently occurs, of course, that for special cases or for a special purpose during the progress of any case the band must be doubled in thickness, but this fact does not change the rule as stated. The pressure exerted by the bands is gentle but constant, and the teeth upon which they operate are moved rapidly, with only the slightest inconvenience to the patient. No plates are used, the fixed points for the application of the motive power being supplied by such of the teeth as are suited to the purpose.

"The method of application is in a general way as follows: The fixed points having been determined, the tooth or teeth to be regulated are connected to them by means of a thin gold band. In selecting the fixed points care should be taken to choose teeth which will offer greater resistance to the force to be applied than those which are to be moved will. The band is then manipulated so as to form it into a spring or series of springs so adjusted as to bear most powerfully on the misplaced tooth. Thus, suppose a projecting superior central incisor is to be drawn inward to align properly with the remainder of the teeth in the arch. A continuous gold band embracing the first molars on both sides is fitted around the outside of the arch. With a dull-pointed instrument like a burnisher the ribbon is then pressed into the interstices of the teeth over which it passes, thus forming it into a series of small springs. The incisor being the most prominent point will naturally be most affected by the pressure exerted by the springs, and in a short time it will be found to have moved away from the band so that it is no longer affected by the tension of the springs. As soon as this occurs the apparatus is removed, the ribbon is annealed, straightened, and a small portion, say a thirty-second of an inch, as may be required, is cut out of it. The ends are then soldered, and the appliance is replaced upon the teeth, the connecting band being formed into a spring as before. Tension is thus kept up until the tooth has assumed the desired position.

"In treating this case I aimed to compass four principal points: (1) the destruction of the 'peakedness' by producing a broader or more oval arch; (2) the reduction of the projecting teeth to their proper position; (3) the improvement of the articulation; and (4) the closure of the space caused by the loss of the right superior central.

"Fig. 1 is the general plan of the apparatus.

"A band was applied, clasping the first molars on both sides, and passing around the cuspids and behind the incisors. A wooden wedge was placed between the incisors and the band, and springs formed by pressing the band into the interstices between the cuspids and bicuspid, cutting and readjusting as before.

"Fig. 2 shows a somewhat more complicated apparatus than any of those previously described. It was used in a case where the right central overlapped the lateral. It illustrates how the method which I advocate may be applied to turn a tooth where the force must be applied directly across the mouth. After the necessary room was provided, this fixture was applied. It accomplished its work in four days, after which a retaining device was applied, consisting of a simple band, clasped tightly around the central which had been rotated, and provided with wings tipping on the left central and under the right lateral."



W. H. S., in the *Cosmos*, 1886, page 327, under *Seamless Collars*, called attention to a new use of these:

"They may be employed in the construction of regulating fixtures; for instance, to rotate a central incisor, take a fine wire and wrap it around the tooth close to but not under the gum, and cut the wire so that its ends exactly meet to measure the circumference of the tooth. Straighten the wire without stretching it; find its equal in length on the collar diagram, and select the medium width collar numbered under that line. Take a piece of thick gold plate, shape it like Fig. 3, and solder it to the collar as seen in Fig. 4, using only solder enough to unite the end of the lever, without flowing any solder over the collar to prevent it from fitting close on the tooth. Dry the tooth, smear its neck all around with oxyphosphate cement, and force the collar over the tooth so that the lever will be in position to be pulled by a ligature, or rubber ring, after the cement has

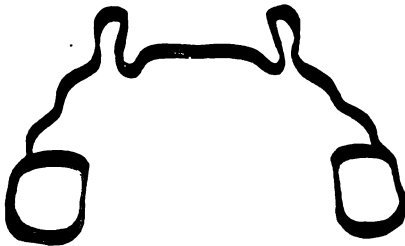


Fig. 1.

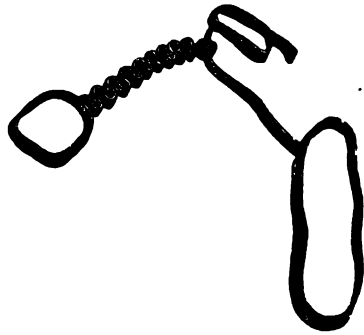


Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.



Fig. 8.

become hard, which should take at least ten minutes. The applied fixture is shown by Fig. 5. A bar regulator that is to be anchored to molars or bicusps may be likewise soldered to collars, which can then be cemented on the anchor

teeth; or the bar may be adjustably connected with the collars, which are then fixed by cement on the teeth. Such fixed collars also serve as fulcrum for jack-screws, the points of which will take on the metal of the collars so as not to slip, and yet leave the enamel uninjured.

"For cutting the collars to conform to the cervical curves, an engine corundum point or Herbst rotary file will serve the purpose."

Garrett Newkirk in the *Dental Cosmos*, 1886, page 601 contributed *Something About Regulating and Regulating Appliances*. He made use of the vulcanite apparatus based on the so-called Coffin spring as illustrated in Figs. 6, 7, and 8.

Isaac B. Davenport. Before the New York Odontological Society in April,



Fig. 9.—Dr. Isaac B. Davenport.

1887, Dr. Davenport read a paper on *The Significance of the Natural Form and Arrangement of the Dental Arches of Man, with a Consideration of the Changes Which Occur as a Result of Their Artificial Derangement by Filing or by Extraction of Teeth*. In 1891 before the American Dental Society of Europe, Dr. Davenport amplified his views in regard to what constitutes correct or normal articulation (occlusion) and the importance of trying to secure this occlusion in all regulating procedures.

In these papers we find for the first time a determined declaration that only by re-establishing normal occlusion can we hope to secure permanent results in orthodontia.

The profession had passed through the experience of and discussion upon Dr. Arthur's method of filing teeth on their approximal surfaces to prevent the extension of caries, and the practice had for some years been discontinued. So,

also, the once common practice of extracting certain teeth, usually the first permanent molars, either to prevent approximal decay or for the purpose of relieving a crowded condition of the arches, had for years been discussed and had come to be largely abandoned, but both practices had been considered and discussed from the standpoint of a desire to benefit the teeth in a general way and to promote their efficiency.

The relation which such filing or extraction might bear to the efficiency of the masticatory apparatus as a whole had not yet been publicly considered, and it was the object of Dr. Davenport's paper to discuss this relationship and point out its great significance. While probably not so considered by its author, it was in very truth an epoch-making paper because it brought to light fundamental facts which had hitherto been overlooked and which, by virtue of their importance, opened the way for marked changes in dental procedures. After presenting the anatomic features of the individual teeth, their relation to one another and the manner in which the occlusion of the upper and lower teeth served the best purposes of speech and mastication, Dr. Davenport proceeded to show how any change of form in any of the teeth, or the loss of one or more teeth, so disturbed the normal relationship as to greatly lessen their efficiency, favor decay, and produce inharmony of the features. After showing numerous plaster models, divided so as to expose the occlusion of the inner cusps of the side teeth as well as the outer ones after their relationship had been altered by extraction and their efficiency consequently lessened, he says:

"But why extract at all? For, besides the loss of important organs we shorten the bite, contract the mouth, disturb the facial expression and secure at least an arrangement of the teeth less favorable for their preservation than existed at first.

"While admitting that under unusual conditions slight extraction may sometimes be resorted to with favorable results, he strongly condemned the practice in general and makes the following significant declaration: 'I am forced to believe that far more irregularities have been caused by extraction than could have been corrected by extraction.'"

*Dental Cosmos*, July, 1887; page 413:

"Nature had furnished man with two dental arches, so formed and so placed in relation to each other as to be best supported at every point, while permitting all the movements necessary for the perfect comminution of his food.

"Each side of both arches, upper and lower, is furnished with its double row of molar cusps, so arranged that the outer, lower row works between the two upper rows, and the inner, upper row works in the irregular groove between the two lower rows.

"The double cuspid arrangement ceases at the angle of the mouth by the suppression of the inner row of cusps and the modification of the outer row into cutting-edges.

"This suppression of cusps prevents an interlocking which would defeat the normal movements of mastication.

"The upper incisors shut past the lower perhaps a little more than the height of the molar cusps. This permits of the cutting movements of the incisors without too much striking of the cusps. (See Figs. 10 and 11.)

"When the teeth articulate well, the lateral arrangement of cusps and furrows permits the greatest freedom of motion with the least separation of the grinding surfaces. (See Fig. 12.)

"The palatal surfaces of incisors and cuspids are so directed, and have such relations to the inclines of the molar cusps, as to permit contact at different planes of the surfaces.

"Finally the general arrangement of the surface inclines throughout the mouth is such as to permit antagonism of the teeth over from about three-fifths to the entire extent of the dental arches, on every plane of articulation (except

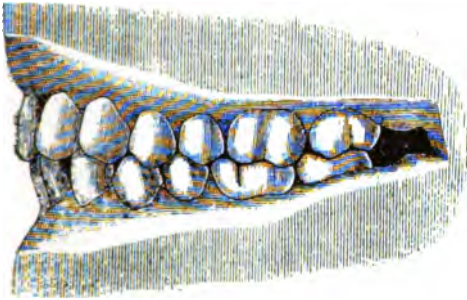


Fig. 10.

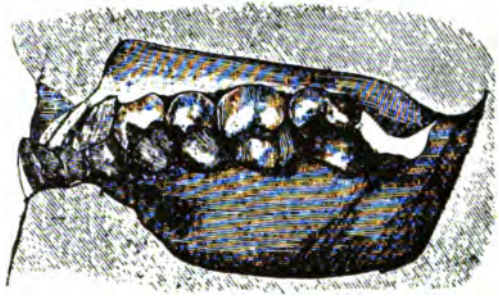


Fig. 11.

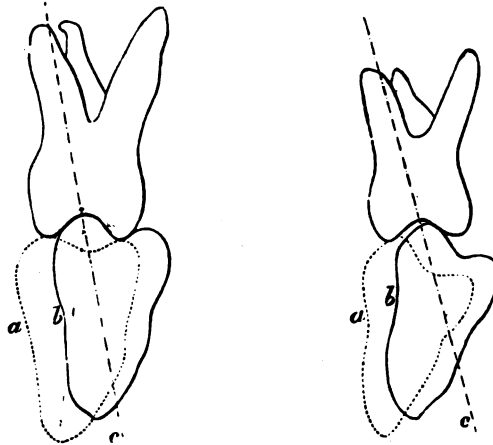


Fig. 12.

for the first part of the cutting motion), and to afford the greatest amount of contact surface for the articulation of food.

"One appreciates the beauty of the general relation of the articulating surfaces as one notes the effects of wear upon the teeth. For example, as the cusps wear down the lower jaw moves forward, and the inner surfaces of the upper incisors become thinner and thinner. When the flat surfaces of the molars alone remain, the cutting edges of the incisors, which projected over the lower teeth, have also been worn away, and we have the characteristic grinding surface called 'double teeth' all around.

"So far our attention has been directed to an ideal dental apparatus taken as a whole, but in its various divisions there is an equal beauty of adaptation of

means to ends, and each part is essential to the working of the whole as is any part of a finely-constructed machine.

"First, we find the arches divided into thirty-two portions, each portion a tooth, having that form, size and strength best adapted to its special office in the completed arch. Each tooth forms with the jaw a compound lever, intended to transmit its proportionate amount of force from the masticatory muscles to the object in contact with its grinding surface, the fulcrum being at the dentomaxillary articulation. The free end of each tooth antagonizes with two teeth of the opposite arch, while it is supported laterally by contact with its fellows, at the point where support is most needed, which is near the articulating surface. Several teeth are thus involved in every important act of mastication; and all are so interlocked and bound in by the articulation and lateral contact that the greatest grinding power is secured, while the strain upon a single tooth is reduced to the minimum. (See Fig. 11.)

"The division of the arches into separate teeth permits the elasticity necessary for the dental apparatus, lessening the danger of shocks and accidents; but its principal object seems to be to allow the slight movement essential for the accommodation of the irregular-shaped masticating surfaces to hard substances in process of reduction. This elasticity is rendered more positive by the inclination of the axes of the teeth, instead of being stubbornly fixed in a vertical position. (See Fig. 12.)

"The inclination of the teeth in one portion of the arch is exactly compensated by an opposite inclination at another portion or else by the inclination of the antagonizing teeth, and so tends to preserve the general form of the arch. Thus, we find that the upper molars are inclined outward, the lower molars inward, and the lower cuspids outward. All the teeth are inclined forward just sufficiently to overcome the opposite forces exerted by the orbicular and buccinator muscles.

"When we examine the structure of the teeth we find nature not less wise. The hard, resisting, nonsensitive enamel exists not only on articulating surfaces, but covers the entire crown down to the gum attachments, as though intended as a barrier against those corroding agents whose greatest havoc is upon the more highly-organized substructure of the teeth.

"Attention is invited to these facts, as they have a bearing upon some of the dental practices of today.

"While analogy teaches that nature's form and arrangement of the dental organs are those best fitted to preserve them, evolved as these organs were under the general law of adaptation according to the need, it is true that diseases have appeared which oftentimes have overcome nature's provisions; but as we have only just begun to learn the causes of diseases, we can hardly jump to the conclusion that man has so changed all of his conditions that nature is disposing of his dental organs, nor can we suppose that he would be better adapted to his present conditions by extraction of teeth, or by so filing the teeth as to secure for them isolation and such a conical form as was necessary during his reptilian stage of evolution. This position is strengthened by practical experience and observation, which prove not only the wisdom shown in the form and arrangement of

the dental organs, but that this form is today the best form known in which to preserve the teeth and their usefulness.

"While it is not pretended that the teeth can usually be saved by any easy method, and without care on the part of the patient, yet, notwithstanding the old doctrine that 'contact is always dangerous,' I am fully of the opinion that they may be more easily saved by the preservation of their normal functions; and to do this we must imitate the form of perfect teeth, and their manner of support by *firm contact* with one another, however 'dangerous' that may *seem* to be."

#### EXTRACTIONS CONSIDERED .

"If any *one* tooth be extracted from the above-described ideal dental arches, with their *perfect articulation* (excepting this *one* be from among the six lower front teeth), there will occur no important change in the position of the other teeth: the space will remain nearly the same, as the remaining teeth will be held in position by occlusion of the opposite jaw.

"If one of the *lower incisors* is lost, contact will again be secured by flattening of the lower arch, with the appearance of overprominence of the upper front teeth; or, the entire lower arch will, because of loss of central support, drop inward and become narrower

"This will be accompanied by a similar narrowing of the upper arch, and the forcing forward of the upper incisors and cuspids.

"Never after the eruption of the second molars can extraction of first molars be considered other than a misfortune.

"After the first molars have been extracted the enormous strain of mastication is brought to bear upon the unsupported second molars, whose yielding sockets allow them to tip till they touch the bicuspid. The time required for this result varies from a year or two in young persons to several years, after late extractions of strongly-set teeth.

"The upper molars rotate upon their axes and tip forward till the outer corner of the second molar touches the middle of the distal surface of the bicuspid, while the anterior approximal surfaces of the third molars rest in the concavity of the distal surface of the neck of the second molars. The articulating surfaces of each, reduced to one or two points, do not permit of any proper grinding movement. During the time occupied by the closure of the spaces mastication has been difficult, for added to the defective grinding surfaces is the great discomfort caused by the irritation of the gums by hard substances, and by the strain upon the sockets of unsupported teeth. The changed relation of the second and third molars renders their cleansing difficult, and when decay occurs, as often happens, it is most difficult to treat, especially when it appears in the mesial surfaces of the third molars.

"After late extractions the teeth are often found so braced in their manner of contact, and so much tighter than they ever are when in their natural positions, that it is difficult to pass even fine waxed silk between them.

"If the author of the expression that 'contact is always dangerous' made his study and observation upon such cases as this, there was a show of reason for his conclusions. But the fact is that the cause of recurring decay in such mouths is not *contact*, but the *changed relations of the teeth*, which, besides impairing their functions, *renders cleanliness extremely difficult* if not impossible.

"But why extract at all? For, as is shown above, besides the loss of important organs, we shorten the bite, contract the mouth, disturb the facial expression, and secure at last an arrangement of the teeth less favorable for their preservation than existed at first.

"It is not denied that in some cases decay is lessened between certain teeth during a part of the time that the spaces exist after extraction; yet I am inclined to think that the temporary advantage which any given space may afford is overbalanced by the greater danger that it offers when it is *nearly closed*, or while the teeth are *loosely in contact*. At this time food easily wedges between the teeth and requires *extra* efforts for its removal.

"In uncleanly mouths we often find decay in the well-open spaces, for food left to ferment in contact with the teeth will cause decay as soon upon surfaces not in contact as it will between those that are in contact and even sooner if quantity of fermentable products is a factor in the problem. Now, if extraction were practiced to prevent contact, it is a failure, for there has been contact all the time between many of the teeth, and finally we have it between all. The few spaces that were secured—say between bicuspid and cuspid—only existed for a time, and perhaps fortunately if the patient were not cleanly.

"Really there seems to be but one excuse for the extraction of the first molars: If their structure were so bad that they were sure to be lost later in life, we have done well in choosing a time for their extraction when the spaces will close with the least tipping of the teeth, and with the least derangement of the grinding surfaces.

"We need not hope to improve deformities at the front of the mouth by the extraction of the first molars, when there is a marked forward inclination of the front teeth, including the bicuspid. The overcrowded front teeth will usually retain their position, owing to the increased bracing caused by the shortened bite. But if such overcrowding is at all relieved, it can only be by a forward movement which increases the forward projection of the arches, and a production of a deformity worse than the one sought to be corrected.

"If the deformity consists simply of a too great forward projection of the upper arch, this projection will only be increased by the loss of the first molars, for owing to the shortened bite the forward strain upon the front teeth will be increased. After such teeth have been drawn back into their desired positions by the use of appliances they will drop forward into their former positions, because the natural forces will continue to act after the patient has tired of retaining plates and their accompanying evils.

"Those who followed the description, at the beginning of this paper, of the form and inclination of the teeth in relation to the forces acting upon them, must see to what a mathematical certainty the matter is reduced. So, if one takes the trouble to acquaint himself with a given case, he may safely predict what form the arch will take after certain extractions shall be practiced.

"One hardly needs to consider the results of extraction of any other than the first molars, since these teeth have been made to bear the penalty of most dental sins, as well as sins of dentists.

"While admitting the value of extraction as a means of correction of certain irregularities of the teeth, I am forced to believe that far more irregularities

have been caused by extractions than could ever have been corrected by extraction."

In the above review Davenport showed the principles of perfect articulation, illustrating same not only with models but by diagrams. In the article found in the *International Dental Journal*, January, 1892, under *Articulation of the Teeth*, Davenport says:

"One may recognize that a defect exists without recognizing all that it involves. In order to realize the real import of an imperfection one must know what perfection is, how manifest, and what it implies, otherwise the attempt to correct faults will often result simply in changing one defect for another, perhaps a worse one.

"We benefit our patients in proportion as we make their teeth approach the standard of perfection, and this can not be done blindly and without a knowledge of what a correct articulation is and what it is able to accomplish, so it seems absurd to hear the statement that 'we always have to do with imperfect articulations, and therefore the perfect standard is of no use to us.'

"That argument ought to be made use of only by those men whose vision is so short that they go cutting and digging about the mouth with perhaps the one noble idea of tooth salvation, but apparently regardless of what the teeth were made for; but theirs is not 'whole salvation' which our Methodist friends would say 'brings happiness as its fruit,' but rather the miserable inheritance of unending repentance.

"Nature never loses sight of perfection. Deformities and useless variations are eternally destined to die out sooner or later, and the fittest survive. In the slow process of evolution is one abiding faith.

"The standard of perfection of an organ can never be lowered or diminished so long as its functional need exists.

"While there are probably few perfect articulations, there are many that are imperfect; yet it is possible to learn what is perfect and what tends toward perfection, by observing articulations which most nearly answer the functional requirements; in time one comes to detect the discordant elements which, eliminated, leave a correct idea of perfect articulation.

"Antagonism seems to express the prevalent idea of articulation; but antagonism is just what is most objectionable in an articulation.

"In order to be well articulated the teeth must be regularly placed and correctly inclined.

"The most common irregularity of the teeth is the irregularity of the position of the masticating surfaces, and yet but little attention is given this matter in works upon irregularities, the attention being mostly confined to the deviations of the external curves or alignment of the teeth; yet if the former were attended to, the latter would necessarily be corrected, and more permanently so than is usually the case.

"When teeth are regular and well articulated, they remain so because the forces and resistances are evenly balanced.

"On the other hand, as the articulation is made up of a series of perfectly balanced inclines, it follows that when anything removes one surface, whether an extraction, decay, operation, or badly constructed regulating or other ap-



paratus, undue force falls upon other inclines with the certain result of changing the position of the tooth or teeth.

"I have hardly ever found what I could call a good articulation a few years after teeth had been extracted, and the same is true when the teeth have been cut away between, or when the cusps had been carelessly removed while finishing fillings in the grinding surfaces.

"Largely on account of bad articulation irregular teeth tend to become more irregular. Growth may improve some cases, but so far as a bad articulation goes it is always unfavorable to regularity of the teeth.

"Much harm is done by the use of regulating appliances which change the articulation without improving it, and it is almost a universal fact that unless an improvement can be made in an articulation there will be no permanent improvement of the irregularity.

"Finally, the articulation is the only permanent retainer to be depended upon.

"The teeth will move till they find the best contact that circumstances can offer, and that movement often never ceases, because the forces never find equilibrium.

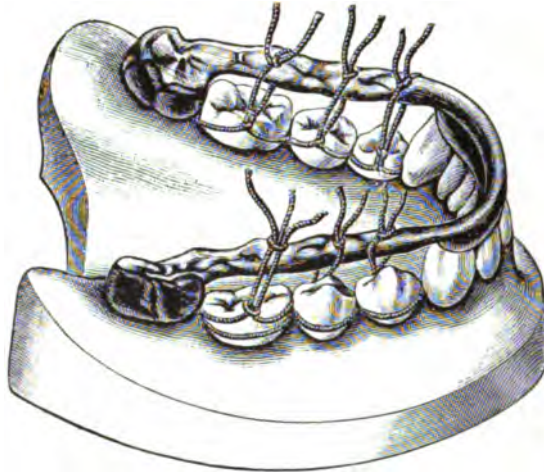


Fig. 13.

"Before disturbing the articulation of a fixed irregularity, it is best to consider whether such disturbance can be overcome, and the articulation again made as good; if not, the chances are that the result will be worse than the original condition, and for the ultimate result we must wait not only 'till the teeth become firm,' as we say, but until they cease to move.

"There is much yet to learn in regard to the meaning of the elevations, depressions, overshutting, shelving, interlocking, binding, curves, and inclines of the articulation, in their relation to biting, cutting, tearing, crushing, and grinding movements of mastication.

"In the treatment of our patients it is hoped that if we can not all see our way clearly upon this matter, that we may at least see far enough not to make the articulations worse by our operations than they are when brought to us."

In the *International Dental Journal*, 1893, W. S. Davenport contributed an article entitled *Twisted Wire for Regulating Teeth*. Fig. 13 shows the method employed before the American Dental Society of Europe, Aug. 5, 1895.

(To be continued.)

# DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

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## BONE GRAFTING IN UNUNITED FRACTURES OF THE MANDIBLE—WITH SPECIAL REFERENCE TO THE PEDICLED GRAFT\*

BY PERCIVAL P. COLE, F.R.C.S.ENG.,

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AND CHARLES H. BUBB, L.D.S.,

*Honorary Dental Surgeon, King George Hospital*

THE evolution of the bone graft as applied to ununited fractures of the mandible is a matter of considerable interest. Since the outbreak of war orthodox opinion has undergone a radical change. The extent of this change can be gauged by a perusal of the *Transactions* of this Section. At a meeting of this Section in 1916 bone grafting as a means of dealing with nonunion was mentioned merely for the sake of academic completeness. Practically, it was either ignored or regarded as a manifestation of somewhat ill-advised activity on the part of surgical visionaries. Compare this view with that deliberately voiced last session by the then president of this Section. In March, 1918, Mr. J. H. Babcock summed up the position thus: "It is evident from the collection of cases on view this evening that the operation of bone grafting as a cure for ununited fractures of the mandible has passed beyond the experimental stage into the region of assured success in a very large proportion of cases. But such success can only be expected when a surgeon and a dentist work in close and sympathetic collaboration, with the full understanding of each other's aims and efforts. No surgeon dealing with fractured jaws can afford to neglect this operation, and no ununited mandible should be given up as hopeless until it has been given a fair trial."

\*Read at a meeting of the Section of Odontology of the Royal Society of Medicine, November 25th, 1918. Published by special permission of the British Medical Journal.

Unfortunately this finding, based on the evidence of results, has been by no means universally adopted. Thus, in an article in the *British Journal of Surgery*, July, 1918, which deals with the treatment of cases at a recognized jaw center, this statement is made: "Fibrous union is treated by a suitable prosthetic appliance." It is obvious that the treatment of nonunion has not been standardized. Opinion tends to the condemnation of the *non possumus* attitude that characterized the earlier days of the war, but procedure is neither settled nor consistent.

How important it is to formulate a consistent, clear-cut policy must be apparent to all. The treatment of ununited fractures is essentially a peace problem. The exigencies of warfare can no longer be invoked to extenuate procedures that fall short of the best, either in plan or in execution. Throughout four years of war the simpler cases have been dealt with to a finish. The clear supernatant fluid has, as it were, been drawn off, leaving a precipitate of remediable or hopeless nonunions. How numerous are these cases, and how have they been dealt with? We are unable to answer those questions, but certain facts can be adduced to show how necessary it is that they should be answered. As to their number, information is very scant, but certain figures are available. Northcroft had 10 per cent of nonunions in his series; Forty had 16 per cent, and we, counting all types of cases, had 11 per cent. It may fairly be estimated that nonunion occurs in approximately 10 per cent of all mandibular fractures. If this be so, the number of ununited fractures must be considerable, for over 1,300 cases have been treated at the King George Hospital alone. The constant appeals made for statistics bearing on this question have, as noted, evoked but little response.

That nonunion can only be remedied by operative measures is an admitted fact. To what extent and with what success surgical intervention has been invoked it is impossible to judge, for the only series of cases other than our own is that published by Platt, Campion, and Rodway. This much is certain, that for at least two years after the outbreak of war isolated attempts only were made to deal surgically with these lesions. As a rule, the attitude assumed by those in charge of these cases was expectant and noncommittal, but occasionally active hostility was encountered.

Taking all these circumstances into consideration, one must conclude that a large number of ununited fractures have been discharged from hospital, their treatment being allegedly completed. Let it be remembered that no surgeon would regard nonunion of any other bone as a satisfactory termination to treatment. Let it be remembered, too, that the disability from an ununited fracture of the mandible tends to become progressively greater as teeth now used for abutments are lost; also, that the maximum of disability will obtain at an age when the compensatory powers of the individual are on the wane. Remembering these things, we maintain that every case so situated should be carefully reviewed, and that wherever possible the condemning dictum should be revoked. Let us quote a striking passage from Mr. John Galsworthy in the first number of *Reveille*:

"Be not trustees of your own departments first, and servers of the general purpose second; keep the restoration of the wounded man in the forefront of your minds and sacrifice everything else—even your own dignities—to that. Restoration of the man and nothing else matters."

The benefits derived, the chances of success, the penalties attaching to failure, the risk incurred, the methods to be employed—such questions as these must be investigated, and upon the answer to them will depend that settled conviction which must necessarily precede the consistent adoption of any fixed plan of treatment. In short, a verdict, favorable or otherwise, must be based on the evidence of results.

It is on that account that we have brought for your inspection every available case, irrespective of their condition or the date of operation. These cases number twenty-three, and include nineteen pedicled grafts and four free transplants. In addition, cases have been shown which are regarded as suitable for one or other of these grafting operations.

The proportionately large number of pedicled grafts will be noted. We have employed this method in thirty-four cases. Free transplants have been employed in twelve cases only. The latter method is only adopted when a pedicled graft can not be utilized.

The pedicled graft operation has been described in previous communications,<sup>1</sup> and it is therefore not necessary to recapitulate the details. The use of this method has been extended to the utmost, and as a result certain improvements have been introduced. It is now usual to perforate the graft posteriorly (Fig. 1, A, B, C). The fixing wire is passed through the substance of the bone, instead of surrounding it, and thus firmer and more reliable contact is obtained. At times both ends

of the graft are perforated. Experience has shown that a much more bulky fragment may safely be detached than we were wont to use. For both of these improvements we are indebted to Captain Tainter of the United States Medical Service, whose valuable assistance has been placed at our disposal.

Another point not previously emphasized is the rigidly aseptic method employed. Skin margins are guarded by towels clipped to the edges of the wound; all knots are tied with forceps and no handling of wound or graft is at any time permitted. Some may maintain that such technic is totally unnecessary and savors of surgical pedantry. It is, however, well to remember that the standard aimed at is rarely attained and that within limits it is impossible to err on the side of a too rigid technic. That the precautions taken are well within these limits is shown by the fact that the operation rarely takes more than one hour and a quarter and is often completed in fifty minutes.

We propose briefly to summarize the conditions our experience shows to be necessary to permit the performance of a pedicled graft operation.

1. *Site of Fracture.*—The loss of tissue must implicate the horizontal portion of the bone—that is, the lesion must be situated at or in front of the angle.

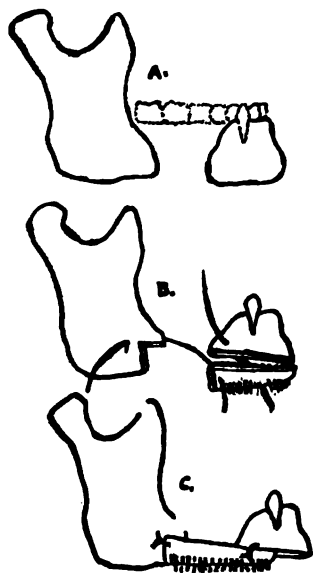


Fig. 1.—A, Diagram of fracture. B, Graft cut. Posterior fragment freshened and wire passed. C, Graft fixed in position. Pedicle shown schematically.

<sup>1</sup>Hunterian Lecture *British Journal of Surgery*, July, 1918. Transactions of the Odontological Section, Royal Society of Medicine, March, 1918.

2. *Size of the Gap.*—This should usually not exceed 4 cm. In favorable circumstances it is possible to cut a thick, well-nourished graft of 6 cm. in length, and a gap of 5 cm. (before trimming) may thus be dealt with, if end-to-end union is resorted to.

3. *Condition of the Soft Parts.*—It is necessary that the tissues of the sub-maxillary triangle should be free from scar tissue on the side from which the graft is to be cut. It is extraordinary how frequently this area escapes even when the soft tissues of the face are extensively damaged.

Nothing has been said as to the more precise situation of the fracture because a lesion on one side can be dealt with by a graft taken from the opposite side. The ability to do this has been demonstrated on several occasions. It entails a considerable dislocation, the definition of a long pedicle, and a consequent tendency to displacement. In two cases of this nature with maximum gaps the results, though good, have not up to now been entirely satisfactory. In both cases the lower jaw was edentulous and atrophic, thus seriously limiting the amount of bone detachable; in both cases the operation was undertaken through scar tissue, and in neither case were perforating wires utilized. In extending the application of an operation a limit must be reached, and reached, in our judgment, it has been in the cases detailed.

It is impossible to refrain from commenting on the technical difficulties forced upon the surgeon by the edentulous jaw. The cases here tonight show how rapidly these jaws become frail and atrophic, militating thus against grafting by any method and adding to this nutritive difficulty the technical one of efficient fixation of the fragments. We are glad to note that, among others, Major Pickerill has joined his protest to those we have made from the earliest period of the war, and we take this opportunity to reiterate our conviction that the multiple extraction of teeth is a policy that should be abandoned.

A brief statement may be made as to the progress of these cases. Without exception, they have been out of bed before the skin stitches have been removed. Progress has been throughout uneventful; an alveolar abscess occurred in one case and stitch sinuses in two others. The splints are removed in from ten to twelve weeks according to the size of the defect. At this time a slight "give" is noticeable corresponding to the plastic stage that occurs in the union of all fractures. As a rule, this bending phenomenon gradually disappears, and firm union ensues in from four to six months. Occasionally union fails at one or the other end. A secondary wiring operation is then undertaken. This has been invariably successful, and the graft when exposed has been indistinguishable in appearance from other living bone. The overlap originally present permits of this secondary operation being performed without any sacrifice of occlusion.

An interesting departure is the treatment by a pedicled graft of two cases in which previous free transplants had considerably diminished the gap but had failed to determine union. A case of this description was grafted in Switzerland. He came to us with free mobility but with a gap that could readily be bridged by a pedicled graft. A sinus was present at the time of operation but no untoward effect has been noted.

It has been stated that 34 cases have been dealt with by this method. In 23 the result is known, and of these 21, or over 90 per cent, have been completely successful. In the two remaining cases the patients themselves are thoroughly satisfied but we can only regard their condition as considerably improved; they are accounted as failures in the appended table of results. The pedicled graft operation permits the utilization of a portion of living bone, possessed of its own blood supply, passing to it from a natural musculo-fascial pedicle. The method of Cavalié, for which similar claims are made, can not justly be regarded as a pedicled graft operation. The results support this contention, for they have been far from satisfactory.

Free transplants are only employed when conditions do not permit the use of a pedicled graft.

Apart from the question of technic, the factors that determine the success of a free transplant may be dealt with as follows:

1. *The Condition of the Soft Parts.*—The operation should not be attempted in the presence of frank or concealed sepsis. We always allow three months to elapse after obvious sepsis has disappeared. As the graft is not vascularized from the bed in which it is implanted the vascularity of the bed is not of direct importance. All that is required is that the soft tissues shall be pliable enough to permit nice adaptation of the graft, and well nourished enough to maintain their vitality when sutured, and thus prevent the introduction of sepsis from without. Excision of puckered and adherent scars is frequently necessary, and plastic operations should be so planned that exposure of the bone ends may be accomplished without undue risk of opening into the mouth.

2. *Condition of the Fragments.*—The size of the gap is not material as an isolated factor. We have successfully dealt with a case in which the graft, 7 cm. in length, extended from the facial vessels on one side to those on the other. The condition of the fragments is most important, both from the point of view of reparative power and the facilities afforded for efficient immobilization. The ends of the bone always tend to become atrophic and sclerosed. This process is progressive, and hence any undue delay seriously diminishes the chance of success. The age of the patient, too, is a most important factor. Delay, then, on both these counts it to be deprecated. So convinced are we of this that we urge operation after a reasonable trial of more conservative methods. This is a question that vitally affects the welfare of the pensioner. The treatment of old nonunions brooks no delay, for every day that passes steadily diminishes the chances of success. The edentulous fragment is an even more burdensome difficulty than in the case of the pedicled graft. If we were asked to state what single item in the treatment of jaw cases had given rise to the most difficulties, disappointments, and failures, we should unhesitatingly answer—the indiscriminate extraction of teeth.

3. *The Graft Itself.*—This may be taken from the tibia, rib, crest of ilium, or scapula. In short the graft may be taken from any bone, the choice depending on accessibility and the physical disposition of the portion removed to conform to the shape and size of the gap and to the methods of fixation employed. The presence or absence of periosteum is not material, as our cases conclusively demonstrate. The results obtained do not compare favorably with those by the pedicled graft

method—hence our preference for the latter. In the case of the long bones, Hey Groves has recently published a series of 34 cases with complete success in 55 per cent. In the series of Platt, Campion, and Rodway the results were extremely satisfactory, and the authors are to be heartily congratulated. The osteo periosteal method of Delagenière has, according to reports, given extremely good results. A series of cases grafted in this manner was the subject of a paper by Lebidnisky and Virenque at the Inter-Allied Conference. These same authors discuss the method very fully in the book recently published by them. Further information is required as to the size of the gap that can thus be dealt with successfully.

Of our own 12 cases the result is known in 10, and of these, 7 have been completely successful, giving a percentage success of 70. Splints are removed in from three to six months. Progress is slow, and firm consolidation can not be expected in less than six months to a year.

We have questioned the earlier patients in both groups as to their present function. Ten replies only have been received. All state that the jaw feels solid; five of these (all pedicled grafts) are on ordinary hard diet; four of these state explicitly that they "can eat anything." As regards the other five the replies are disappointing. One can eat meat if stewed (free transplant); the other four (two pedicled and two free grafts) can only eat meat if minced. This question of subjective evidence is beset with difficulties. When the evidence is positive—when a man states that he can eat anything, that statement obviously can be accepted without demur. The same can not be said of negative evidence. In several cases we know, from observation, that such negative statements have been incorrect. Unsupported negative statements are open to question when at variance with what clinical examination would lead one to expect. The reasons for this are obvious, and will be appreciated by all those present who have knowledge of the working of the Workmen's Compensation Act.

From conversation with our most intelligent patients we are convinced that disability is a muscular failing. When it is remembered that many of our cases have been under treatment for two years, coming to us after a year or eighteen months in splints, this muscular disability is scarcely to be wondered at.

A man with a compound fracture of the femur can perhaps get about fairly well at the end of six months; one does not expect him to be able to play football. Football to a femur is as hard food to a jaw, and we think that, even with union, some functional disability will frequently be long-standing. Ability to masticate is restored invariably to the sound side first, an ability which, in the presence of mobile nonunion, is impossible. On the affected side ability is delayed—the jaw, as it were, walks with a limp.

The position as regards all cases of nonunion dealt with by us may be tabulated thus:

NATURE OF OPERATION	NO. OF CASES	RESULT KNOWN	FAILURE	SUCCESS
Plating . . . . .	2	2	2	0
Wiring . . . . .	20	20	1	19
Pedicled graft . . . . .	34	23	2	21
Free transplant . . . . .	12	10	3	7
Operation abandoned . . . . .	3	3	3	0
Total	71	58	11 = 19%	47 = 81%

No selection whatever has been exercised; we have operated on every case submitted to us. It will be noted that the balance is heavily weighted against ourselves. Thus three cases are counted as failures, in which the physical conditions found by exploration rendered, in our judgment, any further steps impracticable. Again, no "improvement" column has been included, though in most cases improvement has been considerable. In no case has the patient's condition, general or local, been adversely affected by operation. Finally, there has been no mortality, and no complication of a nature to cause alarm.

## SIXTH ANNUAL MEETING OF THE PACIFIC COAST SOCIETY OF ORTHODONTISTS

THE Sixth Annual Meeting of the Pacific Coast Society of Orthodontists was held at the Palace Hotel in San Francisco, California, on May 12th and 13th. The following program was presented:

*President's Address*....Dr. B. Frank Gray, American Orthodontists...Dr. A. A. Solley,  
San Francisco, Cal. San Francisco, Cal.  
Discussion opened by Dr. John R. McCoy, Discussion opened by Dr. C. O. Engstrom,  
Los Angeles, Cal. Sacramento, Cal.

*Orthodontia Observations*...Dr. Wm. Power, *The Co-relation of Orthodontia and Rhinology*.....Dr. E. W. Alexander  
Seattle, Wash. San Francisco, Cal.  
Discussion opened by Dr. H. F. Sturdevant, Discussion opened by Dr. B. Frank Gray,  
Portland, Ore. San Francisco, Cal.

*Art and Orthodontia*....Perham W. Nahl, CLINICS  
of the University of California.  
Discussion opened by Dr. Robert Dunn, *Lingual Wire*.....Dr. Allen H. Suggett,  
San Francisco, Cal. San Francisco, Cal.

*A Consideration of Normal Arch Form, and Some of the Methods of Determining It*.....Dr. James D. McCoy, *Molar Attachments for Lingual Arch*....  
Los Angeles, Cal. Dr. C. O. Engstrom, Sacramento, Cal.

Discussion opened by Dr. Allen H. Suggett, *Showing a Corrected Occlusion*.....  
San Francisco, Cal. Dr. A. W. Ward, San Francisco, Cal.

*Vertical Development*....Dr. Robert Dunn, *The Use of Linen Thread in Movement of Teeth and for Temporary Retention*  
San Francisco, Cal. Dr. Frank C. Pague, San Francisco, Cal.  
Discussion opened by Dr. William Cavanagh, Portland, Ore.

*Radiography in Orthodontia*....Dr. Leland E. Carter, San Francisco, Cal. *The Ribbon Arch*....Dr. John R. McCoy,  
Los Angeles, Cal.

Discussion opened by Dr. Charles C. Mann, Seattle, Wash. *Use of .020 Lingual Arch Wire in Preventive Cases*.....Dr. A. A. Solley  
San Francisco, Cal.

*The Relation of Periodontia to Orthodontia*  
Dr. A. W. Ward, San Francisco, Cal.  
Discussion opened by Dr. James D. McCoy, Los Angeles, Cal., and Dr. D. Arthur Johnston, Los Angeles, Cal. *An Attachment for Biscupid Bands with the Ribbon Arch*.....Dr. Chas. C. Mann,  
Seattle, Wash.



# DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Under the Editorial Supervision of

JAMES DAVID MCCOY, D.D.S., Los Angeles—ROBERT H. IVY, M.D., D.D.S., Milwaukee  
B. FRANK GRAY, D.D.S., San Francisco—C. O. SIMPSON, M.D., D.D.S., St. Louis.

It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

## COOPERATION OF THE ORTHODONTIST AND THE RADIODONTIST\*

BY CLARENCE O. SIMPSON, M.D., D.D.S., St. Louis, Mo.

IN common with other professions and vocations in this age of specialization and efficiency, the practice of dentistry is becoming divided into limited fields or specialties. Orthodontia and exodontia by priority, are generally accepted by the profession and well established in the conception of the laity. In recent years have come prosthodontia, periodontia, pediadontia, and the future will prove and enhance the claims for a distinct field of radiodontia. Although there have been many facetious quips said and written about medical specialists and the interminable visits from one to another for treatment, this development has unquestionably resulted in progress which would not otherwise have been attained. Similar advantages have resulted from restricted study and practice in dentistry. Orthodontia has developed from a haphazard practice of extraction, crude appliances, and a sublime faith in the assistance of Nature, into a marvelous science by which the unfortunate victims of malocclusion have function and symmetry restored. Only a few years ago the extraction of teeth was an important and exasperating phase of every dental practice. Without going back to the period of the turnkey and punch when the blacksmith, the barber, or the medicine man officiated in this capacity, just recall memories of the "cowhorn" forceps and "crowbar" elevators. Reminisce upon the root fragments which the patient was assured would be exfoliated, the "gum freezing" applications which only produced frostbite, the postoperative hemorrhages which caused more alarm than postpartums, and those cases which "took cold" in spite of swathed heads. While many dentists are loath to admit that any one can get a tooth out "slicker" than they and profess keen enjoyment in

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"pulling" teeth, more and more of this work is being done by the exodontist. Dentists and patients have learned that by perfect anesthesia and skillful technic, most difficult operations are performed without suffering or serious injury, to the advantage of all concerned. Compare the service of the prosthodontist to that of the average general practitioner, many of whom have deteriorated to the level of sending a "mush" bite and an impression in a stock tray to the commercial "slaporary," to be supplied with a product having a high polish as its chief virtue. These are examples of specialization in dentistry and proof that the maximum efficiency can not be attained by one who attempts all types of operations. Since this tendency is increasing and promises to result in further division and subdivision, claim is made for a branch of dental diagnosis, in which history, clinical signs, and pathology are used in conjunction with the greatest single diagnostic aid, radiographic examination.

The term *radiodontia*, being of comparatively recent adoption, may require some explanation. It is defined as the art and science of making and interpreting radiographs of the teeth and adjacent structures. Etymologically it is vulnerable to the criticism of having its origin from both Latin and Greek, but it euphoniouly combines *radio* and *odontia* and greatly simplifies the term of dental radiographer and diagnostician, and conforms to the accepted terminology of orthodontia, periodontia, and exodontia. It includes far more than the mechanical procedure of radiography, in that the intelligent examination and interpretation requires professional education, clinical experience, and special study. The qualifications of a competent radiodontist are:

A practical knowledge of electricity, and sufficient mechanical ability to manipulate and maintain radiographic apparatus at its maximum efficiency.

Sufficient experience in photographic technic to secure the best results in the dark room work.

A professional education which includes more pathology, histology, and bacteriology than in the past has been provided in the dental curriculum.

Clinical experience derived from the general practice of dentistry, the longer and more creditable the better, since too many men begin the practice of a specialty without the advantages of experience in general practice, or after having been unsuccessful from incompetency.

An extensive study of radiographic films and plates to develop proficiency in recognizing normal structures and detecting errors in technic and variations from the normal.

A sixth sense which may be called a histopathologic intuition to reason from cause to effect and conversely.

A broad professional spirit with the greatest consideration for the welfare of the patient, assistance to the dentist, and cooperation with the physician.

An absorbing interest and enthusiasm for the work with unlimited confidence in the value and future development of the practice.

With these qualifications the radiodontist may be of inestimable service to the dentist or orthodontist, in obtaining radiographs which disclose most information, in correctly interpreting the record, and in consultation upon proper procedure. The appreciation of radiographs which disclose the most information

comes from careful discrimination and the extensive use of them. To the beginner anything which shows the roots of the teeth is such a revelation that little more is expected, and the majority of dentists accept without complaint, radiographs from which a diagnosis can not be made. Interpretation is precarious enough with the best radiographic records obtainable, and when attempted with less becomes little more than clairvoyance or a guessing contest. Many men are confident of their interpretation just as all were a few years ago, and some now are of their root canal operations. They meet with no difficulties in interpretation because it so often consists only in observing ill-fitting shell crowns, the length of root fillings, and "abscesses." This is not greatly exaggerated, and the lack of study given to the matter has compelled the notation of the areas on the film mount after several were returned for location. If not enough thought is utilized to locate teeth by form, roots, and restorations, what can be expected for anatomic landmarks or pathologic conditions?

While the quest of the orthodontist is usually for specific information concerning unerupted teeth, which an adequate radiographic examination will disclose without exhaustive interpretation, the radiodontist when supplied with the clinical history has a great advantage in the number of radiographs seen and the knowledge of the conditions under which they were produced. A report or conference brings an interchange of ideas which may direct the attention of the orthodontist to unobserved details and supply him with information as to distances and angles. The radiodontist should have a keen interest in, and keep informed upon, the progress in all branches of dental practice, and there is every reason why his association and scientific interest should qualify him to cooperate and confer with the orthodontist. In this connection the following is quoted from an unbiased authority, the United States Government, in the book of instruction to the Medical Advisory Boards for draft examination: "The x-ray while not infallible is a most important aid in the diagnosis of disease. It gives information that can be obtained from no other source. It is therefore advisable in cases of suspected conditions for the registrant to be given the benefit of an x-ray examination, provided a competent roentgenologist is available. The interpretation of roentgenographic findings is of the greatest importance. It is often better to have no x-ray examination than to have it done by a man of limited experience, or with an inferior roentgenological outfit."

The difficulty and inconvenience of referring the patient to the radiodontist is often raised as an objection, but by correct methods, this can be minimized unless the distance is prohibitive. The first step is to impress the patient with the necessity of the examination. In doing this you have the choice of two methods, or a combination of the two; viz., either explaining the advantages by an educational talk, or arbitrarily stating it is imperative for the diagnosis or operation. While x-ray examination is utilized by dentists to a limited degree, too often as a last resort, daily opportunities of its intelligent use are neglected when time and labor could be saved, and better service rendered. The physician, surgeon, internist, in fact all medical specialists, make far more use of the radiographs than dentists, quite likely more radiodontic examinations are made upon the advice of physicians than dentists, and as it has been truly said, the dentist who needs radiography most is the last to take advantage of it.

The cooperation of men in the limited fields of dental practice is of mutual advantage and a great influence in the progress of dental science. We all may learn from men who are intensively studying and operating along lines so closely related as are the specialties of dentistry. Aside from selfish interest in direct gain, the fraternal spirit promotes technical advancement, and the prestige of the profession in the estimation of the laity. The radiodontist in his examinations should consider himself an associate of the orthodontist, with the success of the treatment and the welfare of the patient at heart, and should utilize thought and ingenuity to obtain the maximum amount of information.

The orthodontist should encourage this by requesting specific information from the radiodontist and supplying clinical history, both of which are essential for a thorough examination and an interpretation. It is often difficult to obtain the desired data from the patient or parent because of the mass of irrelevant, inaccurate, and imaginative clinical and family history which the average individual volunteers upon the slightest pretext. (Reference, Cobb's *Speaking of Operations*.)

In the harmonious relationship of coworkers, the orthodontist and radiodontist will find some difficulties of practice made easier; they will derive inspiration for greater proficiency through a mutual technical appreciation; and they will render a more efficient service to the patient, which should be the goal of professional practice.

## RELATION OF ROENTGENOLOGY TO PREVENTIVE DENTISTRY\*

BY HAROLD O. HANSEN, D.D.S., CHICAGO, ILL.

THE roentgenogram is becoming each year, more of a necessity in the dental office, and with the oral hygiene movement rapidly developing, the demand is becoming still greater.

In the beginning, the roentgenogram was employed to detect broken-off roots, impacted and unerupted teeth. Later, as the knowledge of local infections became more widely known, the use was extended to root canal work. The uncertainty and dissatisfaction of work on pulpless teeth has led to more serious thought and consideration for the welfare of the patient, who has been subjected to long tedious root canal operations, the result of which has been at best doubtful.

To avoid these unpleasant features we have directed our endeavors along other channels and find our only solution of the problem in preventive dentistry, which is the preservation of the original tooth structure.

In the normal mouth which contains a full complement of teeth it is estimated that there is approximately twenty-two square inches of peridental membrane surface. Outside of the dangers to which one is subjected by infections around the apices of teeth, the condition of the peridental membrane is the best indication of the safety and cleanliness of the oral cavity.

The roentgenogram affords the only means of studying this attachment and for this purpose we need fine detail and more definite angles than ever was needed in routine dentistry. It is necessary to develop a technic with uniform results. For this purpose in my opinion there is but one type of machine and one kind of tube. When one becomes accustomed to studying radiograms of this class they are more qualified to properly interpret them. These exposures are made with a definite spark gap and milliamperage. So many dental pictures are made with machines which have not the capacity to properly expose a positive film, so the negative or fast films are used with a great sacrifice of bone detail. Nearly three-fourths of all dental pictures are taken on high frequency outfits necessitating the use of these fast films. Although this shows an effort on the part of the dentist to improve, it is nevertheless a great handicap, as these pictures are unsatisfactory even for the experienced roentgenologist to interpret, and for the unexperienced are almost useless. Fortunately, however, with the demand for high grade radiograms the manufacturers are producing more efficient machines and the use of the other types should be discouraged.

With the desire for better roentgenograms and a more careful study of the same has been created an almost new profession, which has for its purpose the abolition of all irritation and infection for the oral cavity, and putting the mouth in condition to be kept clean. These men should be properly called oral hygienists; and the time is rapidly approaching when dentists will divert their time from routine dentistry to this new field. This grand movement is here to stay

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and already its momentum is so great that it would be impossible to stop it, and will yearly increase until our profession will be looked upon as the greatest in the healing art.

Dentistry was created to fill a long felt want; but the only object of dentistry was to restore lost parts, and any benefit that was derived systemically was accidental and merely an incident compared with the replacement of lost teeth.

Dr. Mayo a few years ago at a meeting of the Chicago Dental Society made the statement that the next great step in medical progress in the line of preventive medicine must be made by the dentists, and added the question, "Will they do it?"

Dr. Mayo saw the great possibility and his only reason for asking, "Will they do it?" was due to the fact that dentists as a class are so absorbed in their routine restoration work that to change their line of thought to a higher and more noble pursuit is a slow process. I can answer Dr. Mayo's question and say, "They will do it," but there must be a complete revolution of ideas in the dentist's mind, and he must begin to treat cause instead of effect.

Professor Pickerell, in a recent article, lays emphasis on the interdependence existing between various physiologic functions, and urges upon us the necessity of widening our outlook when dealing with diseased conditions of the mouth and teeth. The disorganization or loss of function of one organ will assuredly lead to the disease of another in the same or allied system.

The mouth is the greatest harbinger and the most extensive breeding place of all pathogenic microorganisms, and here is the origin of nearly all contagious and infectious diseases.

The fact that mouths of each generation are poorer than those of the preceding generation has caused great alarm, and conditions can only change when the organized efforts of the oral hygiene men educate the public to demand dental services which will tend to abolish this deplorable state of affairs, and when there is created in dentistry a full realization of its responsibilities. Then dentists will be saving lives instead of teeth.

Most individuals have a great regard for personal cleanliness and very religiously attend to these duties, but the mouth, the most important portal of entrance of microorganisms, is sadly neglected. To give one some conception of the tremendous number of bacteria in the mouth, Dr. W. Parker Harrison, of Brighton, England, records in the *British Dental Journal* of May, 1915, the following experiment:

Each of twelve toothbrushes was used once, rinsed ten times in a tumbler of water, and after standing for twelve hours all the bristles were removed with sterile forceps and the organisms counted in the usual way. In eight out of the twelve cases more than a million organisms were found, such a quantity of bacteria is comparable with the number of organisms found in sewerage, which is twenty-six million per cubic centimeter, and in one-sixth of the counts made on sterile tooth brushes, used only once, the number on the brush exceeds this. The volume of liquid held by a toothbrush that has had the superfluous water flicked off, as was done in these experiments, is not nearly as much as I. C. C., which renders the comparison all the more to his disfavor of the toothbrush.

These experiments were carried out by the patients suffering from peri-

dental diseases, but it was also found by four experiments on an apparently healthy mouth, that almost as large a number of bacteria were left on the toothbrushes.

The above experiments allow a statement that the millions of toothbrushes in this country are in a most disgusting and septic state; a condition of affairs especially to be deprecated and if possible alleviated; where septic processes are in operation in the mouth, the pyogenic organisms left on the toothbrush today are reinoculated into the mucous membrane of the mouth tomorrow.

When we consider the large percentage of men disqualified for army service in all its branches, and in the more special lines, such as aviation, nearly 95 per cent are rejected as physically unfit, only one man in twenty physically balanced for this service. This fact alone should startle the medical profession and prompt them to analyze the underlying cause, and institute ways and means of abolishing to a great extent this percentage of physically unfit; and the mouth, the fountain head of infection, should receive the first attention.

A study of these facts should not alarm us, it should inspire hope. By ignoring the truth or by refusing to look into it because of the grim depression which accompanies the contemplation of this state of affairs merely betrays our unfitness to deserve a better fate.

Medical men as a class are not interested in dentistry, so do not acquaint themselves with mouth conditions, and so do not realize what class of work is conducive to mouth cleanliness. The only way to be sure is to remove all infection.

The maintenance of a clean mouth precludes the possibility of a rise of secondary pathologic phenomena, which menace, not only the health, but the very existence of the individual.

The secondary phenomena which include some of the most serious lesions known to pathology, have now been proved to be dependent in primary force within the oral cavity, to an extent heretofore undreamed of.

It is obvious that we can no longer consider proposed dental restorations in the light of primary function; but to look beyond this and consider it with relation to the formation of focal infections, and general systemic effect.

When we find that a certain type of restoration can not be accomplished without the formation of possible foci, we must definitely eliminate that type of restoration. When we find that it invariably produces a derangement of cell function and a lowering of tissue resistance, that type should be considered obsolete; no matter how thoroughly it fulfills the esthetic and functional requirements.

Pulpless teeth have been looked upon with doubt ever since the advent of the roentgenogram and more and more are we beginning to realize the fact that they are dangerous and should never be left in the mouth. The fear dentists have of being called radical has kept them from openly announcing their stand on this subject. But in my humble opinion the radical man is the one who allows his patients to carry infected areas of unknown and uncertain virulence, capable of doing inestimable harm, thus jeopardizing the health and happiness of this individual. He is the radical one, as the conservative man always plays safe.

Medical and dental literature has been filled with articles on this subject and many have reported results which seemed encouraging, but one can not build on a weak foundation, and those same teeth which seemed to improve under treatment and apparently were safe, have become reinfected hemolytically due to the fact that the area over a root apex will not remain sterile for any definite period of time or by any method of treatment.

Dr. Gilmer made this statement recently at a meeting of the Chicago Medical Society, "I extracted a large number of pulpless teeth and secured streptococcus viridans from almost every case. Alveolar abscesses, when some of the apical periodontal membrane has been destroyed may be cured temporarily by sterilization of the root canal, but it is for a very limited period, because there will be reinfection sooner or later; the organisms being carried to the dead cementum by the blood stream."

The pulpless teeth should always be looked upon as a foreign body within the bone. No dentist is justified in allowing them to remain in the mouth even though they are well camouflaged by gold crowns and other unpardonable appliances, which are always a direct irritation, unclean, and help maintain a luxuriant mouth flora.

If only a small percentage of devitalized teeth were infected we would still be far from justified in allowing them to remain and jeopardize a patient's health merely for the sake of a tooth. Infection is measured by quality and not by quantity and some of the larger areas discernible about root ends may be causing less systemic disturbance than a small area unnoticed by the x-ray, which may be a very virulent infection. The roentgenogram at best is only a shadowgraph and is never a clear photographic expression of a pathologic condition. Although the best diagnostic means available and a great blessing, still should not be relied upon too much.

Health is the greatest blessing a man can have and when one deliberately and intentionally neglects to remove infection he is as much a criminal as the man who takes life. Before the introduction of the roentgenogram into dentistry one felt justified in allowing these broken down undesirable teeth to remain as they were ignorant of the dangers attached to his neglect, but now, no one is excusable and any one who will casually examine a radiogram and pass an opinion as to whether a certain dead tooth is or is not infected, is doing a great harm. One is merely guessing and has no positive scientific assurance of this fact. I will be glad to present a paper at some future time showing the change both in the numerical and differential blood count brought about by properly cleaning up a mouth.

One of the prerequisites for an oral hygiene man is that he must have an ideal. The man that has no ideal, no matter what his occupation, is dangerous, and the man that pretends to have an ideal and does not live up to it is a hypocrite.

Our ideal is a mouth free from bacteriologic, mechanical, and chemical irritation, and one in which the tissues of the mouth are normal in every respect and each tooth surface highly polished and free from restorations of any description.

There should be no decay, as it only means neglect either on the part of the



patient or the dentist. Without the initial introduction of caries into tooth structure there would be no dead teeth. If half the concentration and effort which is devoted trying to make one dead tooth safe was spent in prevention, there could be ten teeth made beautiful, safe, and free from decay. Most patients have a limit on both the time and money they can spend on dental services, and too often this time and money is spent on dead teeth and the good ones neglected until they are decayed and broken down in a similar manner.

There is no individual who can not get along no matter how many teeth he has extracted as they can be replaced by some sanitary removable appliance, with better results, from the standpoint of the patient's health. This necessitates the removal of pulpless teeth together with those afflicted with pyorrhea beyond the point where they can be saved.

Mechanical irritation is caused by fixed bridgework, crowns, and overhanging margins on fillings, especially the amalgam filling, and should never be used.

Chemical irritation includes the bacterial plaques made up of food particles bound together with the mucin of the saliva, and finds lodgement between teeth and around unpolished overhanging margins of fillings; causing decay, due to the disintegration of the enamel by lactic acid formed by the decomposition and fermentation of the mucilaginous plaques. This is, however, too long a story for discussion here.

We are often asked by dentists, "How can we meet the requirements of the oral hygienists?" The answer is always the same. Remove all devitalized teeth, never place crowns or fixed bridgework in the mouth, and never put in amalgam fillings. Devote your time to preventive work.

When this is done there will be a feeling of satisfaction that the conscientious man is entitled to enjoy.

#### DISCUSSION

*Dr. O. E. Lanphear.*—These clear clean slides and the able papers on dental roentgenology are an inspiration to me and beyond criticism. Roentgenographic localization of a needle or a root by the use of a piece of metal held at the point of puncture or at the mouth of a fistula, by means of adhesive tape, establishes a point from which to measure. Unless this precaution is taken, it might be difficult for the clinician to find the offending particle.

One can elaborate upon this method by having the piece of hard metal, the shape of an arrow, cut from thin unyielding metal, lying in a given direction and plane, held in place over the fistula, on dry gums by collodion, while the part is radiographed in intersecting planes. The nearer the intersection approaches a right angle, the more definite the position of the foreign particle.

For the clinician's convenience, in an edentulous mouth, we establish a position with a fixed block on which to bite. To this block we attach the metal arrow in juxtaposition to the fistula, then two exposures are made as before. The operator can then replace the block for measurements, getting the same information he would were the arrow held in a fixed position over the fistula, on the dry gums, by collodion.

The localization and delineation of impacted third molars by Dr. Simpson's superior technic is the finest thing I have ever seen. It was both clever and skilful. He gives the clinician clear, first-hand information.

I agree with Dr. Hansen when he says, "Three-fourths of the fast dental films are poor," but in my opinion, the fast film is maligned.

There are many possibilities of errors in the wide range of technic where the element of time is the predominant factor, as in nervous children, the fast film will often show superior results.

# **ABSTRACT OF CURRENT LITERATURE**

**Covering Such Subjects as**

**ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY**

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

## **ORTHODONTIA**

**Apical Movements of the Teeth.** L. Valderrama. *La Odontologia*, 1918, xxvii, No. 12, p. 625.

One of the difficulties confronting the successful practice of orthodontia is due to the fact that the most favorable time of life is in early childhood, namely between four and six years of age. In private practice, before starting on a course of orthodontic treatment, the dentist must first make sure of the normal support and intelligent cooperation of the parents or guardians. In children who about the age of six years show an absence of interdental spaces, a future malposition of the permanent teeth is to be anticipated, for the alveolar processes at this time must already feel the stimulus of the budding permanent teeth and under normal conditions, with proper occlusion of the temporary teeth, the latter will become spaced so as to leave room for the permanent teeth. From the age of four years on, there should exist a minimum distance of 28 millimeters between the cervico-lingual borders of the second upper temporary molars, a smaller interspace suggesting an incipient anomaly of occlusion. The slowest and most difficult movement for the orthodontist to bring about, in order to correct dental malpositions, undoubtedly consists in the vestibular version of the apical portion of the teeth, for it involves a change in configuration of the entire alveolar process, and in a general way of the bone in which the teeth are inserted. What is required is, not merely a simple movement of the teeth, but a change in shape of the bone, and thereby of the patient's physiognomy. This change in the facial contours takes place very gradually, good occlusion finally resulting from the establishment of proper equilibrium of all the parts concerned. Seeing that the profile is the anterior boundary of the face in unilateral projection, it must be kept in mind in altering the position of the teeth that this limit represents the best obtainable improvement. The remainder of the face will at the same time be brought nearer to the normal standard, for there exists a very close relation between the profile and the other zones into which the face has been divided by progressive orthodontists.

In cases where apical movement is indicated, in youthful individuals whose bones are not yet strongly calcified, and when the causes of the malocclusion have not produced a very obvious anomaly, briefly when the treatment is largely prophylactic in character, a variety of more or less simple appliances may be utilized. The new apparatus of Angle hardly exerts enough tension to move the apex of a canine tooth of the ordinary size, without great effort and loss of time. In the author's opinion, the apical movement of teeth can be accomplished by means of a practicable apparatus devised by him, which works continuously, without interruption, and automatically enough to render frequent visits to the dentist unnecessary. The power of this apparatus can be regulated so as to fit the requirements of a given case. Three illustrations serve to explain the principles on which this orthodontic device is based and to show the manner of its application.

**The Value of the "No Good"—Malocclusion. D. H. Stewart. *Western Medical Times*, 1919, xxxviii, No. 9, p. 363.**

Malocclusion should be considered as much of a symptom as any symptom—to use the author's own eloquent phraseology—and by its correction the removal of other symptoms should be rendered possible. In the presence of malocclusion, the sternum, the ribs and the spine are not normal, or even approximately so. A common accompaniment is adenoid hypertrophy, together with the fairly constant presence of nasal abnormality. If the upper jaw is much distorted, then every cavity in the head is also distorted, with the possible exception of the ear, the function of which is but too often ruined by a catarrhal process that never would have started were it not for the bad ventilation of adjoining cavities and their membranes.

The ignoring of a basic fact, like the great importance of the relation of a good mouth to bodily health, in no way lessens the importance of the fact itself. Therefore, perhaps, one of the greatest benefits to mankind would follow from a public health service that insisted that every child from five to seven years of age should have a mouth that is either in good working order or is put in that condition.

**Disease and Facial Expression. I. W. Voorhees. *The Trained Nurse and Hospital Review*; April, 1919.**

The author points out that the importance of recognizing the possibilities of permanent deformities in the faces of growing boys and girls can not be overestimated. Certain facial irregularities represent a part of our evolutionary inheritance, in the form of the ape-like long upper lip, the wide prominent mouth, the short chin, the high cheek bones and the receding forehead. A more serious condition sometimes occurs in the form of cleft palate and hare-lip combined or separate, and due to an arrest of embryologic development. Such defects should be repaired by a skilled operator at the earliest possible moment so as to

guard against an increase in size of the gap. Narrow upper jaw and high, V-shaped roof of mouth are usually referable to a superabundance of adenoid tissue or other nasal obstructions. All these patients are habitual mouth-breathers in whom as a result of the mouth being always open, the lower jaw drops, becomes elongated and tends to over-ride the upper jaw. The orthodontist finds a most promising field for his activity in the correction of these deformities.

## ORAL SURGERY

**Military Plastic and Oral Surgery.** C. E. Black. *The Journal of the National Dental Association*, 1919, vi, No. 3, p. 211.

In the fourth of a series of lectures reviewing some of the recent literature, delivered before Officers' School of Plastic and Oral Surgery, Northwestern University Dental School, 1918, the author discusses the surgery of the jaws, plastic operations, fractures, dislocations, and anesthesia, on the basis of contributions scattered through the literature. He found the general surgical literature on this subject rather scanty, while the dental articles are too technical and do not contain a sufficiency of general practical considerations applicable at the front. Quoting extensively from Blair's *Surgery and Diseases of the Mouth and Jaws*, he says with special reference to plastic operations that in the early days of the war, where extensive separation of the skin and soft tissues of the face accompanied fractures of the jaw bones with loss of substance, the inclination was toward immediate closure of the facial wounds by suture, little or no consideration being given to early correction of the bony displacement. As a consequence the cases finally came into the hands of the oral and dental surgeon with the soft tissues tensely united over the deformed bones, and the difficulties to be overcome in correction were enormously increased. It has now become a well-recognized principle that no attempt should be made to suture the soft parts with the idea of closing a gap until such time as union of the fractured parts in correct relation is well under way and permanent splints are adjusted. By keeping the mouth cleaned and reducing displacement, there will be less disfigurement to rectify. It is desirable to wait until scar tissue has formed.

**The Treatment of Maxillary Fractures in Serbia, 1914-15.** A. Poulio. *The Dental Magazine*, London, January-February, 1919, p. 1.

In this paper (read at the Inter-Allied Dental Congress held in Paris, November 10-13, 1916, and translated from the *Comptes-Rendus of the Proceedings*) which is based on the author's work in the capacity of surgeon and of dentist, on three hundred and forty-five maxillary fractures, he enumerates three different methods of fixing the fragments, now in use: (1) The splint in metal wire, fixed upon the fragments by the aid of rings and ligatures. (2) The splint in cast tin, in three parts, which are united by two hinges. (3) The splint in

one piece which covers all the teeth, and is constructed of cast silver, or struck in German silver, and strengthened by wire. Excellent results are obtainable with each of these methods. The first and second procedures were employed by the author in person, his preference being for metal wire splints as the mode of fixation. The splint is composed of two rings and an arc of metal wire. As teeth for anchorage, the molars were ordinarily employed. If the fragments are properly replaced and the splint correctly adjusted, perfect articulation is obtained, analogous to that existing before the injury.

Summarizing his experience, the author points out that in treatment of fractures of the maxillæ we require: (1) Collaboration of the surgeon and the dentist. (2) Avoidance, at the commencement of the treatment, of operations which are not absolutely necessary. The treatment ought to be conservative. (3) Accomplishment of the perfect fixation of the maxillary fragments in normal occlusion. (4) An operation (cleavage) in fractures of the mandible which have become consolidated in false positions, and the fragments must be fixed anew in their proper position. (5) In a case where after perfect fixation, supuration has ceased and where three months later osseous consolidation has not occurred, it will not occur. We have, therefore, to do with "pseudoarthrosis." (6) Pseudoarthrosis ought to be treated by the removal of the fibrous tissue and bringing together the extremities of the fragments and suturing them. (7) The only treatment of pseudoarthrosis of the maxilla according to scientific rules which gives complete success is bone-grafting.

**Chin-cap and Skull-cap Replacing Inconvenient Bandages in Cases of Fracture and Mutilation of the Maxillæ. V. Guerini. The Dental Magazine, London, January-February, 1919, p. 11.**

In this paper which was read at the Inter-Allied Dental Congress held in Paris, November 10-13, 1916, and translated from the *Comptes-Rendus* of the Proceedings, the author describes a chin-cap devised by him, made of aluminum plate and furnished with holes. Its form is such that it is capable of containing the entire human mandible, and it can be widened or narrowed to suit individual requirements. In order to maintain the chin-cap constantly adherent to the fractured or mutilated mandible, even when in a state of rest during sleep, it is united to a small wire skull-cap by very thin elastic threads attached to little hooks of metal affixed to the extremities, or alternatively by rubber rings. The chin-cap which is supplied at its upper edges with several holes serving for points of attachment and retention, remains continuously adherent to the mandible with a slight pressure from below upwards caused by little elastic cords which pass from hooks on the skull-cap to the holes of the chin-cap. The apparatus serves equally well for healing maxillary fractures and for fixation of the fragments, the two dental arches remaining continually in close contact. The skull-cap, as well as the chin-cap, may be employed independently. If the wounded or mutilated patient to whom the whole apparatus is applied shows injuries on some part of the face or of the cranium, the dressings may be maintained by a slight and constant pressure of the elastic cords of the apparatus if the injuries are situated on the face, and by the skull-cap if the injuries are on the cranium.

**Conclusion.**—The chin-cap and the skull-cap are of incontestably practical utility; they succeed in fixing fractured maxillæ, maintain the dressings always against the mandible, the face and cranium, and thus avoid the possibility of the wounds being infected. (2) They are easy to sterilize. (3) The chin-cap and the skull-cap are both very light and elastic, and their weight does not exceed a hundred grams. (4) The chin-cap being pierced, and the skull-cap being gauzed, transpiration is accomplished in a normal manner. (5) The application is easy and within the competence of all, and the apparatus is constructed in a shorter time than is needed for a bandage. (6) The circulation of the blood is more free, the wounds heal more rapidly, the cosmetic result is better, and the hygienic conditions are superior to those obtaining in the customary methods of treatment with bandages.

**Plastic Prothesis in Face Mutilations.** L. Rousseau Decelle and Ch. Dubost. *La Restauration Maxillo-Faciale*, 1919, iii, No. 1, p. 15.

The authors emphasize that the merits of the plastic prothesis are not sufficiently recognized, for a variety of reasons. The procedure consists in the taking a mould of the face, the reconstituting the missing part by wax, the casting it in paste with a gelatinous basis, and the putting it in place by means of a suitable cement. Of course, these plastic gelatine protheses are not durable and can not be expected to last more than three days, but the patient can be trained so that the renewal of his prothesis becomes an automatic act for him. About ten protheses may be cast in advance, so that the very simple work which is necessary will have to be done only three times per month. In order to guard against irritation of the skin through the cement, the authors recommend a concentrated dextrine solution instead of resinous and ether varnishes. It goes without saying that these plastic protheses must always come after the completion of all surgical operations, and that they are only recommended in those cases where it is absolutely impossible for some reason or other to accomplish a satisfactory repair, or when the cosmetic results obtained by surgery are inadequate. Finally, patients while waiting for an intervention often gladly avail themselves of the advantages of their prothesis, which permits them to mingle with their fellows without attracting attention.

**Conduction Anesthesia.** A. Chornet. *Revista del Centro Estudiantes de Odontologia*, 1918, v, No. 10, p. 415.

Conduction anesthesia, for its successful application, requires accurate knowledge of the topography of the nerve supply to that portion of the body which is to be anesthetized. This form of anesthesia readily lends itself to stomatological surgery, where it may prove highly serviceable. The technic of conduction anesthesia of the anterior dental nerve, which sends branches to the upper incisors and canine teeth, and at the same time of the sphenopalatine nerve, is very

simple, consisting merely in the application, in the anterior region of the corresponding nasal fossa, of a small tampon of absorbent cotton, the size and shape of an almond, soaked in a 1:20, or better, 1:10 solution of cocaine, combined or not with adrenalin 1:1000. Solutions of novocaine, stovaine, and various cocaine substitutes, may be employed for the same purpose. The anesthesia is not complete until fifteen or twenty minutes after the application of the tampon. The anterior dental nerve can also be reached and anesthetized by means of injections at the level of the infraorbital canal, where the nerve branches off from the superior maxillary nerve.

Conduction anesthesia of the inferior maxillary nerve can be obtained by placing the anesthetic fluid in contact with this nerve trunk at its emergence from the cranium through the foramen ovale.

The inferior dental nerve can be anesthetized at its entrance into the dental canal, or by the buccal or internal route, or by the cutaneous or external route. At the level of the mental foramen, this nerve terminates in two branches, the mental nerve which passes through the foramen to the skin of the chin and the lower lip, the labial mucosa, and subjacent glandular layer; and the incisor nerve which penetrates into the incisor canal and sends filaments to the incisors and canines of the corresponding side. Through the mental foramen, which is situated at a point external to the inferior maxilla, at an equal distance from the lower border and the alveolar border of this bone, in a vertical line passing between the two bicuspid or through the second bicuspid it is possible by means of a small amount of anesthetic solution to arrest the nervous conductivity of the incisor branch, and probably of the mental branch, thereby obtaining anesthesia of the regions supplied by these nerve branches.

In a general way, it may be stated in conclusion that conduction anesthesia of all those nerves is practicable the trunks of which can be brought in contact with an anesthetic solution.

### **Pseudarthrosis of the Lower Maxilla. G. Plouvin. *La Restauration Maxillo-Faciale*, 1918, ii, No. 12, p. 524.**

The author reports very satisfactory results obtained in the case of a wounded soldier by means of a saddle apparatus mounted on "knee-pan," with springs which maintain the saddle in the proper position while affording some elasticity. The patient came under treatment with a double fracture of the lower maxilla viciously consolidated to left and destruction of the right lateral portion of the horizontal branch. Rather loose pseudarthrosis extending from the right angular region to the right lateral incisor of the lower maxilla. Imperfect occlusion owing to the vicious consolidation to left and anteversion of the median fragment. The apparatus in two parts, in use in the military dispensary of the Paris Dental School since the beginning of 1916, proved so serviceable in this instance as to justify its employment in a number of other cases. The good results are accomplished by gradual immobilization until the fragments are in equilibrium. The apparatus is composed of: (1) One silver hame for properly enveloping the teeth for the retention. (2) An inserting saddle of the ascending branch, provided with two strong springs, one external.

the other internal, and mounted on "knee-pan" to facilitate all the movements. When absolute immobilization is obtained (very slowly and by gradually getting used to the same) the only work left to do is to weld the saddle to the ham and to place on this base a block of teeth for the articulation. Thus the apparatus becomes a rigid apparatus in one piece, with supporting surface on the ascending branch.

**War Injuries of the Face.** W. Rosenthal. (*Ergebnisse der Chirurgie und Orthopädie*, 1918, x.) Medical Supplement to the Review of the Foreign Press, 1919, ii, No. 3, p. 208.

The necessity of cooperation between the surgeon and the dentist is emphasized by the author, as well as the importance of early treatment in facial and jaw cases. For lower jaw injuries an early splint attachment is recommended which, while allowing the mouth a certain amount of gape, prevents displacement of the fragments. With special reference to free bone grafts for the jaw, the author in discussing the relative advantages of the jaw itself, the rib, the clavicle, the ilium, the tibia, and the metatarsus, as sources of the graft, inclines on the whole towards the ilium and the tibia. Greater importance is attached, however, to the technic than to the source of material for the graft. Preservation of the periosteum is very essential to success, and the periosteum must not be infiltrated when the operation is performed under local anesthesia. He recommends that the graft should be transferred directly to its bed without intervening immersion in fluids, and with a minimum of handling, the periosteal edges being then stitched together with catgut, to which procedure the author attaches great importance. He admits, however, the possibility that the freshened end of the jaw fragment with its medullary tissue may also play a part in the final union of the graft, although regarding this as unproved. There is no limit to the size of the free bone graft, which may be followed by perfect union and proportionate functional result.

Various methods of dealing with salivary fistulæ as a result of gunshot wounds are also described, as well as methods for the treatment of defects of the lips, nose, eyelids, and palate. For the latter, all closure by obturators and dental appliances is rejected, the author maintaining that whatever their size and position, they are capable of being closed by plastic operation.

**Extra-oral Expansion Device with Bilateral Grooves for the Treatment of Fracture of the Mandible.** E. Morale. *La Restauration Maxillo-Faciale*, 1919, iii, No. 1, p. 54.

"The object of this apparatus is to spread and to replace in a satisfactory position a fragment of mandible displaced to the median line on account of a fracture with loss of substance which extended from the right to the left cuspid. A special feature of this apparatus is provided by the separate action of each sliding member, which makes possible the movement as desired of the front or the back of the fragment, and to arrest the progress of either end at



any desired point. Since this apparatus is removable it is easily kept clean, the patient can take it off, clean it, and put it back again without any other help, as owing to the tension of the rubbers, the openers find their place themselves. The patient who used it took it off to take his meals and this did not interfere in any way with the progress for the correction. The fracture was a year old, the tissue which had formed was very resistant, and the various screw or spring apparatus which had been previously used produced no result."

The extra-oral expansion device described in the original accomplished in a month and a half a sufficient expansion and adjustment of the parts, with occlusion of the upper and lower teeth, after treatment with a number of other appliances had proved unsuccessful.

### ***RADIOGRAPHY, Etc.***

**Two Rare Cases of Ossification of Ligaments Recognized Through Radiological Examination.** C. Guarini. *La Riforma Medica*, 1918, xxxiv, No. 11, p. 208.

In a case in which the lower jaw remained movable only in the vertical direction, but to a limited degree, while the ability to masticate was considerably diminished, the author succeeded in demonstrating the ossification of the sphenomaxillary ligament by means of radiography. In another case, ossification of the fibrous articular capsule of the right thigh could be demonstrated radiographically. Without the assistance of the x-ray apparatus, it would have been impossible to render the correct diagnosis in both these cases, as the clinical picture might have been produced by a variety of changes. In the case of the first patient, a soldier who was wounded by a shell splinter in the region of the right ear, the radiological examination showed a shadow apparently due to ossification of the sphenomaxillary ligament. Small metal splinters were present in the surroundings of the ligament. There were no well-marked bony lesions of the mandible and temporomaxillary articulation on the right side. The ossified ligament was identified as the sphenomaxillary ligament on the basis of anatomic and physiologic considerations. The patient's functional disturbances were due to adhesions between the ossified ligament and the ascending ramus of the jaw. The ossified ligament interfered with the action of the pterygoid muscles in moving the jaw forwards and imparting to it movements of adduction and abduction. Cases such as these illustrate the possibility of ossification of ligaments as a result of traumatism in the vicinity of bones.

**Electro Medication.** W. H. Jordan. *The Dental Summary*, 1919, xxxix, No. 3, p. 203.

Iontophoresis, also known as ionization, or the driving of particles charged with electricity into the tissues, is advocated by the author on the basis of personal experience as the most dependable and easiest method of treating oral infections, worthy of the most thorough investigation by the dental profession.

The advantages of ionic medication in dentistry are many: It is not in the least painful if the proper current strength is applied, is extremely effective, placing at our disposal a method of reaching deep infections with disinfectants, antiseptics, and sedatives, and is very easily carried out, with a simple readily obtainable apparatus. Marked improvement is apparent immediately and is unmistakable by both patient and operator.

Electrically charged moving particles or ions will not pass through the tissues in a direct line from pole to pole, but will branch out, seeking paths of least resistance. This means the ionization of a wide area and eliminates all possibilities of failure to reach all parts of the lesion under treatment, provided the current is on for a sufficient length of time. Different ions are indicated in different cases. The chlorin ion, dissociated from sodium chloride, or any metallic chloride, has the property of softening and dissolving fibrous or granular growths, such as a granuloma, probably increases phagocytosis, has some antiseptic properties, and without doubt is indicated in the abscessed root where no systemic reactions are apparent, or very little bone destruction has occurred. If chlorin is used in the treatment of suppurative or inflamed conditions, the normal salt and the negative electrode is placed in the canal or pus pocket, and thus the chlorin ion travels into the tissues toward the positive electrode, which is in contact with the body at a more or less distant part.

**Radiography Laboratory Points. J. A. Van Brekle. American Journal of Electrotherapeutics and Radiology, 1918, xxxvi, No. 9, p. 260.**

The following important paragraph of this valuable contribution deals with a subject of orthodontic interest. Tooth infection and its relation to systemic infection has come into such prominence lately that more and more dental radiography is being demanded. For the physician who wishes to check up on the sources of infection, the ability to do his own dental radiography not only saves time but causes a good deal of first hand satisfaction. Using a chair to which a dental head rest has been attached, the patient's jaw can be suitably placed for exposure. The best size film for general use is the  $1\frac{1}{4} \times 1\frac{5}{8}$  inch extra fast. Two difficulties will arise in attempting dental work. First, it will be hard to arrange the film in the patient's mouth so as to cover the roots of the teeth to be radiographed and so as not to curve the film and thus provide for distortion of the image. Try to keep the film flat and push it well up or down as the teeth to be taken are in the upper or lower jaw. In case of doubt as to whether the root is covered or not, put the film in so that the length of the film corresponds to the length of the teeth. Fewer teeth can be taken at one time in this way, but one is more apt to reach the ends of the roots. The second difficulty is found in trying to focus the tube correctly. The plane of the film and the plane of the tooth taken on its long axis will not be parallel, the root being farther away from the film than the crown and thus creating an angle between them. It will be found by experiment that if the ray is directed in a line perpendicular either to the plane of the film or of the tooth, the image will be distorted and of small diagnostic value. But if the ray is directed in a line perpendicular to a plane which bisects the angle formed between the tooth and the

film, a minimum of distortion will result, and this then becomes the direction of choice. In x-raying teeth, a cone of small diameter should be used. If the opening in the cone is quite small, the beginner will find some difficulty in always covering the film with the ray. Continued practice alone will overcome these difficulties of focusing, but the result of a well-focused dental radiogram is so satisfactory that the extra practice is well worth while.

**Note on the Use of Ionization in the Treatment of Certain Types of Facial Scars.** H. L. Carter and A. D. E. Shefford. *British Medical Journal*, February 22, 1919, p. 214.

Upon the basis of personal favorable experience in a series of twenty-four cases, the authors conclude that ionization, usually with chlorine ions, is of undoubted value in the treatment of facial cicatrices. The circulation through the scar tends to become reestablished, there is loss of stiffness and adherence, permitting the play of underlying muscles and reduction of the limiting effect of the scar upon the masticatory muscles. This therapeutic measure in their opinion may be advantageously combined with the mechanical procedures of intermittent intraoral gagging and massage. In this experience the results are best when the gag is applied for an hour immediately before treatment. It is recommended, in cold weather to warm the area to be treated with hot water or by the use of radiant heat by means of a small cup reflector for fifteen minutes before commencing ionization. This therapeutic measure was likewise found serviceable in cases where the edges of the flaps, after facial plastic operations, are rolled and thickened, causing retraction of surrounding normal tissue. By increasing the softness and flexibility, ionization helps to diminish the deformative effects of postoperative facial scars. The treatment of the scars by ionization was found to result in a progressive decrease in their densities and an increased flexibility, both subjective and objective, with marked permanent improvement in ability to open the mouth and masticate. Adherence of the scar to osseous tissue offers greater resistance, and the treatment has to be prolonged in these cases, often for a period of three months or more. The best results were obtained by ionization with sodium chloride as an electrolyte.

**Interpretation of Dental Radiograms.** G. F. Thomas. *The Dental Summary*, 1918, xxxviii, No. 12, p. 909.

The limitations of the radiogram in diagnosing dental lesions form the subject of the author's interesting and valuable contribution to odontologic literature. He explains that in view of a variety of factors, the x-ray film alone can not be relied on entirely for all diagnostic data, for it is merely a macroscopic record of the structure and the density of the tissues, or rather a composite of all the superimposed shadows of the infinite number of layers of which the tissues are composed. In interpretation, the thickness of the bone and the overlying soft tissues, as well as their relative densities, must be considered. The first requisite to a good interpretation is, of course, a good film or better still two or more good films of the same region taken from different angles. The essentials

in a good film are good contrast of tissue densities, sharp definition of bone structure and minimum distortion.

The various structures of the tooth (which is the densest tissue in the body) have enough difference in density to show up on a radiogram and permit a distinction between the enamel, the dentin, the pulp cavity and the root canals. Small cavities can be detected, and occasionally a carious process can be discovered within an apparently sound tooth. The first stage of infection is indicated on the film by an abnormally dark area, due to the locally diminished tissue density through absorption of the lime salts. During a period of one to several days, however, according to the author's personal observations, a very intense inflammatory reaction with hyperemia and exudation may be taking place without sufficient variation from the normal density to be demonstrated radiographically. The bone changes in pyorrhea alveolaris are, of course, clearly demonstrated on the radiogram, so that the extent of the destruction of the alveolar process can be ascertained at a glance. When absorption takes place along the sides of the root, the white line normally produced by the compact bony lining of the lamina dura or cribriform plate of the alveolus is obliterated, and a broad zone of osteoporosis indicates the area of involvement. Osteomyelitis of the jaw is characterized by areas of absorption, areas of sclerosis and periosteal new bone formation, the predominance of these various characteristics depending on the stage of the process and the relative degree of reaction.

**Cancer of the Oral Cavity, Jaws, and Throat; Treatment by Electrothermic Methods or in Combination with Surgery, the Roentgen Ray and Radium, with an Analysis of 200 Cases so Treated.** W. L. Clark, *Journal American Medical Association*, 1918, lxxi, 1365.

Clark recommends electrothermic methods as best adapted to the treatment of cancer within the mouth. The methods he refers to are electrodesiccation and electrocoagulation. The first method is one by means of which malignant growths of small or moderate size may be destroyed by the utilization of heat of just sufficient intensity to desiccate the tissues, and is produced by monopolar high frequency current. The desiccation method is of advantage when the lesion is localized and a good cosmetic result is desired. Electrocoagulation is produced by a bipolar high frequency current. It is more penetrating and intense in action than the desiccation method. It is utilized to destroy large growths.

The distribution of the cases treated and the results obtained are herewith presented. The areas involved were: upper lip, lower lip, upper jaw, alveolus and hard palate, alveolus (lower jaw) and floor of mouth, tongue, buccal surface, antrum, tonsils, pharynx, epiglottis, larynx, base of tongue, and esophagus, advanced lesions involving several structures in the mouth.

**The Role of Focal Infections in the Psychoses.** F. A. Cotton. *New York Medical Journal*, 1919, cix, No. 10, p. 397.

The necessity for very radical treatment of oral infections is insisted upon by the author who has all his patients, on admission to the New Jersey State Hospital, examined by the dentist as soon as possible. Every suspicious tooth

is extracted and cultures are taken. When there is any doubt as to extracting the teeth, the teeth are radiographed. After many unpleasant experiences caused by being too conservative, the practice has been adopted to extract every tooth that is at all doubtful.

Instead of resorting to the simple expedient of radiographing the tooth to see whether the root is infected, many dentists unfortunately continue to cap teeth with gold crowns which inevitably aggravate an infection already present.

"Hardly a patient of the better class is admitted to the hospital at Trenton who has not had expensive gold crown and bridge work, and our first act is to tear it all out, for by experience we know that it is infected." Neglected and decayed teeth are not apparently as productive of diseased conditions as capped teeth. When devitalized teeth are either capped, pivoted, crowned, or filled, with a pre-existing infection at the apex of the root, the outlet is closed up and the bacteria continue to proliferate under the ideal conditions furnished by the dentist; they seek an outlet through the porous bone tissue and there gain access to the lymphatic system and migrate to other distant organs. The streptococcus types occasionally invade the blood stream.

In view of the fact that very extensive involvement of the roots of teeth can exist and be the cause of serious trouble without causing any pain to the patient, such infections can be successfully treated only by an expert dentist who realizes the dangers and controls his work with frequent x-ray examinations. Thoma, of the Harvard Dental School, contends that it is impossible to treat successfully these infections by any means, such as ionization or local application, and the author is inclined to agree with him. If the patient's condition is serious, no time should be lost and the tooth should be extracted at once. The x-ray picture in many cases gives only the slightest evidence of the diseased condition, and only when the bone is involved, the abscess being always much worse than it appears to be in the picture. In other cases, in which no serious root trouble is revealed by the x-ray, new granulomatous tissue is sometimes seen surrounding the tooth just below the gum or between the roots of molars, and found on examination to be teeming with bacteria. The author emphasizes the fact that most of the focal infections due to streptococcus have their origin in the teeth, and from this source, in the course of years, the organisms reach remote organs on other structures.

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## EDITORIALS

### The Prevention of Dental Disease

DENTAL diseases, says the *Medical Record*, for some time have been fruitful subject for discussion. To an infected condition of the mouth and gums has been attributed a variety of diseases, more or less serious, and undoubtedly it is in this respect a factor of very considerable importance.

The causes of dental caries, according to Mr. J. G. Turner (*Journal of State Medicine*, London, September, 1918), have been shown by experiment to be two: (1) The presence of carbohydrates, starches and sugars; (2) The presence of germs. Carnivorous and grass-eating animals are free from caries. The Esquimaux used to be practically carnivorous, and it was found on examination of

skulls from an old Esquimaux graveyard that they did not suffer from caries. But today they have added fine flour and molasses to their dietary and are afflicted with caries.

It has been stated frequently by some authorities that masticating hard food acts as a preventive of tooth decay by giving the jaws exercise and that a great deal of the decay existing is due to the ingestion of soft pappy foods. However, Turner is inclined to throw some cold water on the theory and is of the opinion that big jaws and fine teeth are more a racial characteristic than a product of much use of the teeth. So far as diet is concerned, he points out that the eating of fruit decidedly cleans the teeth on account of its acid content.

With regard to the prevention of caries, Turner insists that the one essential is thorough cleaning, that is, every tooth which is exposed in the cavity of the mouth should be well rubbed once a day. The toothbrush must be supplemented by the use of waxed silk thread so as to scour each interstitial surface. At all schools a nurse's time would be well spent in teaching and supervising the cleaning of children's teeth, and such teaching should be begun at the earliest possible age. It is urged that if this plan were conscientiously carried out much of the dental caries which now exists so widely would be prevented and at the same time the sequelæ of prolonged dental disease would never occur. Turner lays down as the great principle of treatment that septic teeth are far more injurious than absence of teeth and that therefore the treatment of both caries and pyorrhea when well established should be carried on somewhat on the lines of forestry, removing some to isolate others. That artificial teeth are not a necessity is a statement with which many persons will find fault, although it is doubtless true that some of the mechanical dentistry which is undertaken nowadays does more harm than good. From the esthetic standpoint alone artificial teeth are more or less essential and the scientific dentist is as necessary for the proper conduct of the hygiene of the mouth as the all 'round hygienist and sanitarian is to the preservation and maintenance of the public health. The value of the dentist has been conclusively demonstrated by the war.

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### Care of the Teeth and Child-Welfare

THE Council of National Defense, although originally created for the purpose of fostering and promoting our war activities, has extended its sphere of influence and proved its value in such a manner as to merit being continued as a permanent institution.

Take, for instance, the Child-Conservation Section of the Field Division. Of course, the movement of promoting child conservation is an entirely proper one, on purely economic grounds, as an appropriate field for the activities of the Council of National Defense. It gains additional importance, since a serious and somewhat humiliatingly large proportion of the young men were found physically defective during the selective-service examinations.

The point of these remarks is, to refer to the recent suggestion, by the Child-Conservation Section, to the state chairmen of child-welfare, according to which

lessons on the care of the teeth are to be given by the teachers in the public schools. The examination of many thousands of school-children in this and other countries shows that nearly all have dental defects.

The results of these defects are innumerable, the most immediate being, a considerable impairment of the power to comminute the food. If there are too few teeth, or if they are broken, decayed or otherwise unfit for doing the work of chewing, or if they are so irregular that the grinding surfaces do not meet properly, mastication will not be complete, so that the other digestive organs will have to do the work neglected by the teeth.

Digestive disturbances inevitably follow. Many forms of illness result from the presence, among the roots of decaying teeth, of tiny pus-pockets, which continually discharge their poisonous contents into the blood stream. Furthermore, there is abundant evidence to show that the bacteria of disease, including those of tuberculosis and diphtheria, find lodgment in dental cavities and in irregularities of the teeth. The neglect of proper cleanliness increases the possibility of attack by many kinds of disease.

While all this is rather elementary, it may serve to suggest to dentists and physicians just those terms and words that they might employ in teaching their patients to practice suitable care for the preservation of not only their own teeth, but even more especially, of those of their children.

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### **Permanent Staff Appointments of Forsyth Dental Infirmary**

**A** COMPETITIVE examination of graduates in dentistry (of less than three years' standing) for appointments to positions on the Permanent Staff for full and one-half time service will be held early in June at the Forsyth Dental Infirmary.

Appointments will be made for one or two years as follows: Full time service requiring operating five and one-half days a week at a salary of \$1000 a year; One-half time service requiring operating six half-days a week, either forenoon or afternoon, at a salary of \$500 a year.

These appointments will be made subject to satisfying the requirements of the Massachusetts State Board of Registration in Dentistry and to "qualifying" in the practical work of the clinics during one month's trial.

Members of this staff are entitled to the advantages of reports and clinics by experts in the various branches of Dentistry from different parts of the world in addition to the numerous special and regular clinics and lectures. Operators after serving four months are eligible, by qualifying, for appointments in the special clinics where Post Graduate work is given. The operators on this staff have the advantage of the clinics and lectures of the Post Graduate School of Orthodontia. The Infirmary clinics provide unusual advantages in the various departments of the institution where Operative Dentistry, Orthodontia, Nose and Throat and Oral Surgery, Extracting, Novocaine Technic, Radiography, Pathological Diagnosis and Research work are continually carried on.



The average number of cases treated daily in the various clinics is over 300. Supplies and necessary operating instruments are furnished; up-to-date apparatus including electrical engines, sterile instrument trays, fountain cuspidors, compressed air, and the modern operating-room-type of laboratories are available for use. A diploma of service will be issued by the Trustees to each member of this staff who has completed this term of service in a satisfactory manner. Applications for the above positions should be made not later than May 15th. Information and the date of the examination will be furnished to those interested by Harold DeW. Cross, D.M.D., Director, 140 The Fenway, Boston, Mass.

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### Preparedness League Notes

EARLY last autumn the President of the League wrote to different members of the Dental Corps in France, seeking information as to the condition of the dental profession in the devastated regions, but has been unable to get definite data except from Captain Blake Sears, who has, during his available time, been making a survey of those conditions which call for aid from the dental profession of America and Canada.

In a partial report Captain Sears states that there is a great need for help, and strongly approves of action in this direction. The matter was brought to the attention of Dr. Villian, who heartily endorses the movement and is anxious to collaborate with us. He was one of the organizers of a society in Paris to carry on this work. Funds were raised which already have been exhausted, and the time is opportune for us to show our fraternal spirit by raising funds and supplying equipment for this society to place where it is most needed. Before this notice will be printed, we hope the movement will be well under way and some funds made available for this purpose.

We are getting reports from different parts of the country of the excellent service our members are giving the worthy families of the Soldiers and Sailors. This is a most commendable object, and we sincerely trust that it will be continued so long as there is actual need. It is a splendid and practical way of demonstrating our readiness to help compensate for the sacrifices made by our boys.—J. W. BEACH, *President*.

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## ORIGINAL ARTICLES

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### A REMOVABLE RETAINER\*

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BY C. A. HAWLEY, D.D.S., WASHINGTON, D. C.

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AT the meeting of this society in Chicago, July, 1918, in the course of a discussion of Dr. J. V. Merzhon's paper, I incidentally mentioned a removable retaining device which I had been using with some success. My further experience with this retainer has been so gratifying that I now feel justified in presenting the matter more in detail.

As I stated at the time, my first ideas of the retainer were gained from Dr. R. D. McBride, of Dresden, Germany, while visiting his office in 1906. He had been using a form of retainer for several years which embodied certain basic principles, the value of which impressed me very strongly.

This device consisted originally of a rubber roof plate with heavy flat bars of metal passing between the first molars and second bicusps to the buccal surface. These bars on the buccal surface were fashioned into planes which slid back of similar planes on the lower apparatus for the purpose of holding the proper mesio-distal relation of the two jaws. A piece of 17-gauge round wire extended around the outside of the arch in contact with the labial and buccal surfaces of the teeth and was fastened at either end to the bars which passed between the teeth as previously mentioned (Figs. 1 and 2). He used also in some cases, instead of a roof plate a very heavy wire bent to the lingual surface of the teeth as shown in the illustrations.

The use of the retainer as made by Dr. McBride was never very successful in my hands, yet I have considered the principles upon which it was based so promising that I have persisted in its limited use and study since that time. One after another the most objectionable features have been eliminated, until I now have great confidence in its practicability and have used it almost to the exclusion of everything else for a couple of years.

\*Read before the Nineteenth Annual Meeting of the American Society of Orthodontists, St. Louis, Mo., March 10, 11, 12, 1919.

It is hardly necessary to enumerate the obviously objectionable features of this original appliance, yet it might not be out of place to mention some of them.

First, the wide spaces necessary between the first molars and second bicuspids were often troublesome. Food often became packed in a pocket under the bar and often the bar was pushed down further than intended through the



Fig. 1.



Fig. 2.

breaking or displacement of the stops. Then, if the appliance was left out a few days the spaces would close. This possibility prevented a most important final use of the retainer which will be described later.

Second, the side planes for holding the mesio-distal relation I found successful in only a few cases. With our present understanding and practice, I think they are wholly unnecessary.

Third, the labial wire was too heavy and had too long an extension without supports.



Fig. 3.



Fig. 4.



Fig. 5.

The retainer as I am now using it consists of a skeleton plate fitting accurately the lingual surfaces of the teeth. From the plate, back to the cuspids, where there are always spaces even in closely occluding dentures, passes a 19-

gauge gold wire, which is formed into loops, and between them passing over the labial surfaces of the incisors is a flat wire .022x.036. Attached to, and extending backward from the 19-gauge wire is a bicuspid clasp (Figs. 3, 4 and 5). On the lower a wire hook is embedded in the plate and passes between the lingual cusps of the first molar over the margin of tooth to keep the plate from being pressed down at the heels. (Fig. 6.)

If it is desired to correct or hold the overbite, a flat ledge is built on the upper plate. This can be extended into a bite-plane to assist in correcting or holding the mesio-distal relation where it is needed (Fig. 7).

There are four important movements that must be provided against in retention:

First: The expansion and form of the arch.

Second: The rotated teeth must be prevented from returning to their former positions.



Fig. 6.



Fig. 7.

Third: The mesio-distal relation must be maintained.

Fourth: The overbite must be established.

As for the first, the holding of the expansion and form of the arch, the efficiency of a plate needs little comment. It is one of the oldest and most reliable means used for that purpose.

As for the second, the retention of rotated teeth, the possibility of this method most aroused my interest in Dr. McBride's appliance and I might say my skepticism as well. However, I may say that I am now succeeding better in holding such teeth by this method than I have by bands or spurs or any other method I have ever employed. By glancing again at this device (Fig. 3), it will be seen that in order to rotate, a tooth must lift away from the plate which closely fits the palatal surface. This the labial wire prevents it from doing. If a tooth is seen to start in this movement the wire may be made to press harder at this point, the tooth will return to place and the movement will be stopped. The question might naturally arise, why the device succeeds while lingual and labial wires combined, soldered to cemented cuspid bands are gen-

erally a failure in preventing incisor teeth from rotating. The reason probably is that no wire has been made to fit the lingual surface as accurately as does the plate and would not be safe from injury to the tooth, if it were not removable, even though it were so fitted. Also the labial wire in such a cemented device has not the same elasticity or adjustability.

There are some exceptions to be made to the teeth that may be held from rotation with this retainer. Round or commonly called peg-shaped lateral incisors or lower bicuspid for obvious reasons can not be retained by this means. For the latter I use a cemented band with a flat vertical bar attached, which fits



Fig. 8.



Fig. 9.

into a slot in the plate (Fig. 8). To hold the second bicuspid when rotated, it is necessary to extend the bicuspid clasp over these teeth (Fig. 9).

As to the third, the mesio-distal relation, this has been one of the most troublesome problems in the development of this retainer. The use of intermaxillary rubbers with a removable fixture is impossible unless some bands are used to make it semifixed and these bands seriously detract from the perfection of the retainer. However, I have found that if the arches are so harmonized that the forward and proper occlusion is the only comfortable one for the patient and all interfering cusp relations corrected, and with the help of muscle exercises developed by Dr. Rogers, we will have very little, if any, need of former methods of retaining this relation. In extreme cases as previously men-

tioned the old form of bite plane can be constructed on this plate and gradually removed as it is found that it is no longer needed.

Fourth, the overbite is retained and can be corrected by building on the plate a flat or slightly inclined shelf back of the incisors.

The method of construction is very simple. The wire framework is made on a model of plaster or artificial stone (Fig. 10). These I have bent by hand with bending pliers. The wire, embedded in the plate and up to the end of the loops is 19-gauge clasp gold or Ney's "E" wire. The portion from this point passing over the labial surfaces of the incisor teeth is flat or ribbon wire .022 x .036, the size of Angle's ribbon arch wire. I prefer Ney's "E" wire for this



Fig. 10.

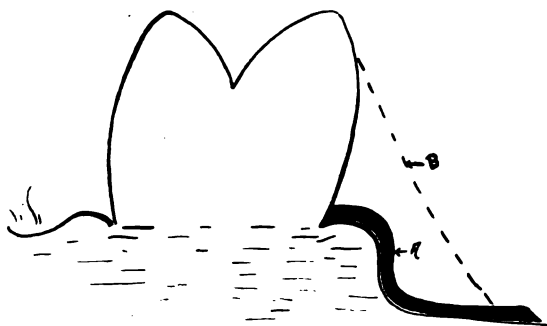


Fig. 11.

also. The union is made with 18 karat solder. The flat wire is slightly festooned to fit the labial surface of these teeth. Extending backward from the loop is a bicuspid clasp, soldered to the loop. This is 19-gauge "E" wire. The convex form shown in the illustration has been very successful. It is important that it should pass over the bulge of the bicuspid with some spring and lie at rest, without tension, near the gum line. After the framework is finished the plate is waxed up and vulcanized.

It is essential that the rubber plate should be as tough and springy as possible. The waxing should be accurately done without surplus and vulcanized between two sheets of No. 60 tin foil. The plate, where it comes in contact with

the lingual surfaces of the bicusps and molars, should be thin so as to spring over their convex lingual surfaces and thus assist as much as possible in holding the plate in position (Fig. 11). The use of a rug-a-pack to reproduce the natural rugæ of the mouth adds materially to the comfort of the plate.

After making ten gold plates, both cast and swaged, I have abandoned them altogether and replaced every one with rubber plates. They were preferred by the patients on account of the lightness, and by myself on account of the greater simplicity of construction and ease of changing the part in contact with the tooth. One idea that I had was that the wires could be mended easier when broken with the gold plate, but I find that by using a strip of wet cotton in contact with the rubber held with a pair of pliers, the wires can usually be mended successfully on the rubber plate.

My scheme for the use of the retainers is as follows: They are only used when the denture is complete, that is when there are no deciduous teeth remain-



Fig. 12.

ing in the mouth. When the case is ready for retention, I take the impression, make the plate and fit it carefully in the mouth, adjusting the labial wire so that it is in contact with each tooth. A piece of floss silk passed between the wire and the teeth will help to determine this fact. The patient is instructed to wear them constantly, removing them only for cleaning, and if necessary while eating. They should be examined in a few days or a week, and any small adjustments made that are necessary. They are worn constantly for two to six months, during which time they should be occasionally examined. If, during this time the patient wishes to remove them for a few hours for some special engagement, it can be done without harm. After this period, I have found that wearing them at night only, is sufficient. Prophylactic treatment or filling operations can, of course be done without interference at any period of the retention. It will be understood that if there is a bite plane, its work must be finished and the molars and bicusps must be in close occlusion before the constant wearing is abandoned.

After they have been worn at night for about a year, they can be left out



for several days or a week and then tried in. If they bind or go in hard, it is evident that the teeth are changing and the nightly use must be resumed. The patient can thus keep the plates for years as a check against retrograde movement and we have a provision for the different lengths of time that different cases need retention. This important feature could not be utilized in Dr. McBride's retainer on account of the closing of the spaces between the first molar and second bicuspid. In some cases of patients going to foreign countries I have two sets made to be used in case of loss or breakage.

The appearance in the mouth is not displeasing (Fig. 12), in fact, much less so than most fixed retention. Where teeth are missing from any cause, they can be satisfactorily supplied during retention by attaching to the plates.

A considerable amount of movement can be accomplished with this retainer. Either arch can be expanded a small amount by heating in the center, stretching and then cooling in that position. The position of a tooth that is labial to the proper line can be corrected by cutting back the plate with a small stone, being careful, however, to preserve the form of the lingual surface, then adjusting the labial wire to press upon the tooth. Teeth that are slightly lingual can be moved out by cutting a recess in the plate and building on cement, amalgam or fusible metal. Thus, if in an emergency, it is necessary to retain before the teeth are quite in a satisfactory position, it can be done and the final movement accomplished later.

If the teeth are in place at the time the impression is taken, no fear need be experienced for the slight movement that will take place during the few days that will elapse while the retainer is being made. Wearing the retainer a day or two will bring them back to the positions they occupied when the impression was taken.

In conclusion, I wish to say that no claim whatever is made in this retainer for originality or invention. It is a new adaptation of some of the oldest things in orthodontia. Its development has consumed considerable time and thought, but the relief from the uncertainties of fixed retention in my own practice has been ample compensation. I have no idea that it is perfect or can not be improved, but am offering it to the society with the hope that many helpful suggestions will be made.

#### DISCUSSION

*Dr. Ralph Waldron, Newark, N. J.*—Mr. President, Members and Guests of the American Society of Orthodontists: There is but very little I can say in opening the discussion on Dr. Hawley's paper except to endorse it, and this I most heartily can, for it has been a great aid to me, not only as a retainer, but as a working appliance, in certain cases which I will explain later.

About three years ago while visiting Dr. Hawley in Washington our conversation drifted to the problem of retention, and in his remarks Dr. Hawley said, "I have a copy of a paper written by Dr. R. D. McBride of Dresden, Germany, on a removable retainer, which possesses some admirable features, also some disadvantages, I will let you take it.

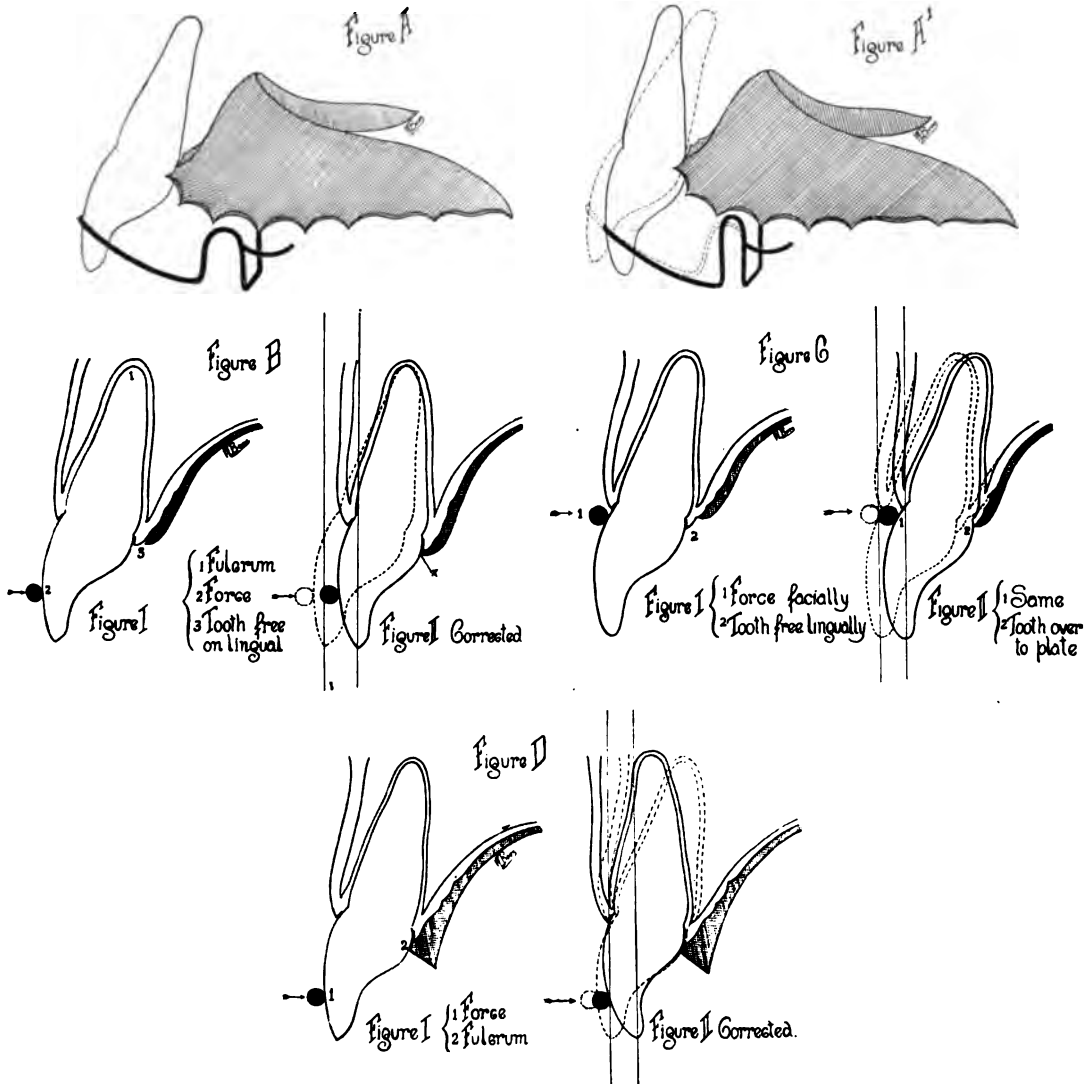
On one of my subsequent visits to Dr. Hawley, I found he had overcome some of the objectionable features, such as more secure attachment, closer adaptability, simplicity of adjustment, etc.

I went home most favorably impressed with the removable retainer, and began using it almost exclusively with its various modifications to suit the case at hand.

I do not wish to discuss the construction of this appliance, for Dr. Hawley has already done so, but will try to explain the dynamics of it.

Fig. A shows the retainer with a loop in the labial alignment wire for the adjustment of the same, and a wire clasp which fits accurately on the first bicuspid tooth, making a very secure attachment.

If we close up the loop which is located in the canine region a millimeter or so, the labial alignment wire is shortened just that much, bringing the six anterior teeth into a



more normal approximal contact, and also into a more lingual position than they previously occupied.

This is well shown in Fig. A<sup>1</sup>.

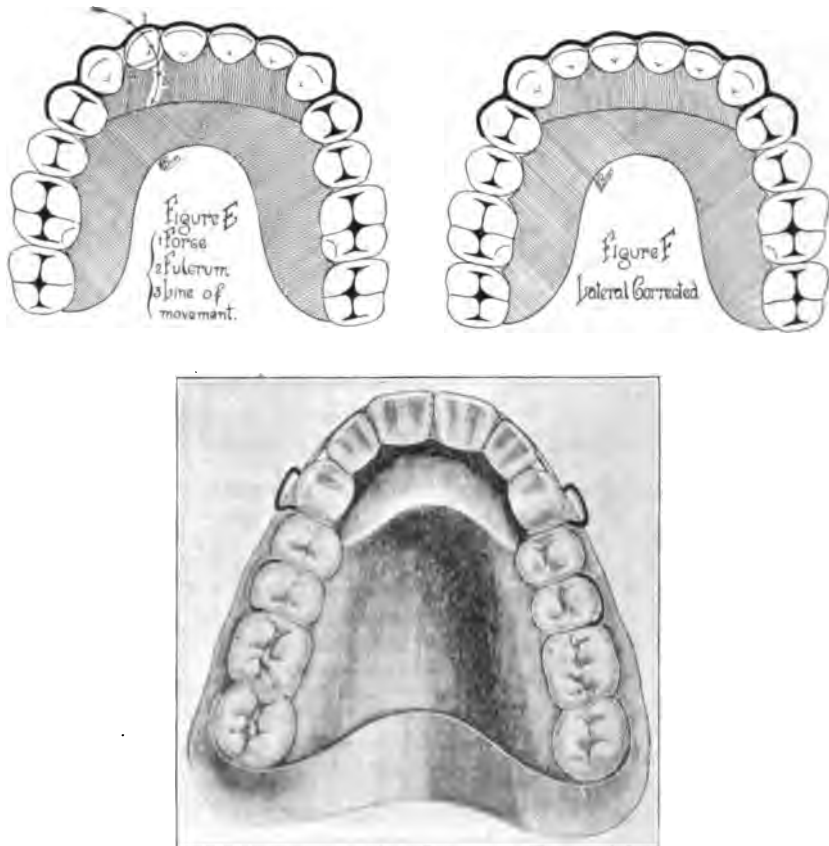
Fig. B shows a sectional view of an incisor tooth and a removable retainer. The shaded portion in a cross section of the vulcanite portion of the retainer, and the dark circle shows a cross section of the labial alignment wire.

If the force is applied in the direction of the arrow by closing the adjusting loop

of the labial alignment wire, then the fulcrum will be at the apex of the tooth 1, and the tooth will be moved until it comes in contact with the vulcanite portion of the retainer at the point X as shown in Fig. II corrected. Then if more force is applied at 2, the point X becomes the fulcrum and we now change from a lever of the second kind to a lever of the first class, which would result in moving the apex forward.

Fig. C shows the alignment arch close to the gingiva. If force is applied in the direction of the arrow, the tooth will be moved toward the lingual more bodily than in the previous Fig. B.

In the treatment of distoclusion cases, particularly when accompanied by labioversion of the upper incisors which are often considerably elongated (Class II, Division 1 Angle), this is an admirable posttreatment appliance.



Reproduction of Fig. 403 from Jackson's book on Orthodontia.

We can not expect to equalize the arches with this appliance, but we can change the angle of inclination of the incisor teeth, and keep the mandible forward without intermaxillary elastics by means of a bite plane attached to the appliance as shown in Fig. D. thus depressing the incisors both upper and lower, and opening the bite in the posterior region, which will permit of the elongation of the bicuspid and molar teeth if the case so requires it.

Fig. E shows an occlusal view of this retainer in position. You will observe the right upper lateral in torsoversion. If the labial alignment arch is bent so as to bear with slight pressure on the mesial approximal angle, the tooth will be moved as indicated by the arrow until it occupies its correct position as indicated in Fig. F.

While this appliance is new to us as a retainer and a great deal of credit is due to

Dr. Hawley for its development, I find Dr. V. H. Jackson used a similar appliance as shown in Fig. 403, Jackson's *Orthodontia*, 1904 edition, for jumping the bite forward, a term used in those days for bringing the mandible forward.

Dr. Jackson makes no mention of using this appliance as a retainer as will be seen from the following description of Jackson's appliance found on page 340 of his book, and you will note from the illustration and description that the clasps for attachment are dissimilar from those advocated by Dr. Hawley.

"Jumping the Bite Forward.—When the jaws are inharmonious in their mesio-distal relations, and jumping the bite forward is indicated, any spaces that exist between the teeth of the upper arch should first be closed by moving them inward, and an apparatus anchored in each arch for the attachment of small rubber bands for causing the required anterior and posterior traction as described; or a semicircular spring can be shaped to pass in front of the incisors with the ends anchored in a palatine vulcanite plate used to support an inclined plane, as seen in Fig. 403. The plate is made with suitable means of anchorage, as with spring or wire clasps, with a projection of rubber extended from the anterior part sloping sharply downward and backward for forming the inclined plane; it should be shaped so that during occlusion it will pass back of the lower incisors and cuspids, causing the lower jaw to be moved forward for a distance usually equal to the width of one of the bicuspid teeth. The closing of the lower incisors against the inclined plane in the manner described has the effect of stretching the lower jaw, encouraging its anterior development."

Dr. Hawley recommends that you wax up these retainers and send them to the laboratory to be vulcanized and finished.

This procedure I would condemn for they are very likely to file and polish away the very parts you need and thereby ruin the retainer, particularly if you have a bite plane which is to perform other functions than keeping the mandible forward, which I have previously mentioned.

*Dr. Alfred Paul Rogers, Boston, Mass.*—A few weeks ago it was my privilege to spend several hours with Dr. Hawley in his office, during which time I examined five or six patients who had reached that stage of treatment where the application of the removable retainer, which Dr. Hawley has been telling us about, seemed to be beneficial. One of its features that impressed me particularly was its value from a prophylactic standpoint. In many cases it would seem that the patient might be rid of bands and wires of various sorts at least a year in advance of the other modes of retention. The teeth, being free from unnecessary restraint, are enabled more readily to settle into final adjustment. I believe it is going to be particularly valuable in undertaking muscular work in an endeavor to establish functional activity which is so essential to the permanence of occlusion.

Of course, I imagine there are some types of irresponsible patients where it might prove disadvantageous to make use of this kind of appliance, but the failures on this account would be few. The appliance is used mostly on patients who have had considerable experience, being applied when the case is nearing completion.

*Dr. Burt Abell, Toledo, Ohio.*—I am anxious that this appliance and Dr. Hawley should have all the credit that is due it and him, but there is one thing to its advantage, it seems to me, that has not been mentioned either by Dr. Hawley or Dr. Waldron.

In a fixed retention attached to any tooth, cemented, of course, with both upper and lower fixed, it takes a very successful man to so adjust tube that there will not be a spring of one jaw or the other in the teeth where the bands are cemented. The posterior teeth, the bicuspid and molars, with this appliance, are perfectly free to move in any direction that the occlusion seems to force them. They can settle together without any interference with the appliance. They can settle into normal occlusion so far as the adjustment of the appliance is concerned. That is one disadvantage I find in using the Lourie retention. Unless I am careful to use a horizontal tube between the jaws, either upper or lower, there is a spring of one set of molars or bicuspid. That is one disadvantage it seems to me, because we all admit that every tooth should have all the freedom possible to move in a normal arch or circuit, or whatever you may call it, retained only

so that it does not get out of position. The disadvantage to my mind occurs in the anterior teeth. There is not sufficient mobility, in my judgement, with the bar across the front, and what amounts to a bar, the vulcanite rubber at the back.

*Dr. Ralph S. Baldwin, Washington, D. C.*—I would like to add a few words to what has already been said with regard to this retainer. I have worn these retainers for something over a year, and I have put them to every kind of use and abuse for experimental purposes, and personally I cannot say too much in favor of them. As the doctor said, I used the appliance for my case of protrusion, and my upper teeth shut inside of the lower. After two years or more of treatment I established very fair occlusion and have maintained it with these retainers.

There is another added feature. I lost recently a right lateral, and I immediately took an impression and attached to the appliance another tooth and it worked nicely indeed. There are some cases in practice where the teeth are congenitally missing or fail to come in, or there may be reason for maintaining spaces, and instead of the wire clasp and leaving a space, this plate can be utilized to supply the missing tooth.

I have had the opportunity along with Dr. Hawley of applying two hundred of these retainers, and we can show you how simple this retaining appliance is.

*Dr. Frank M. Casto, Cleveland, Ohio.*—I would like to ask Dr. Hawley whether or not the patient wears this retainer continuously.

*Dr. Hawley.*—I answered that question I think in the paper. These retainers can be removed at any time, for two or three or six or seven months I have them worn day and night, according to the character of the case. After about six months, which is not a definite time, or after a certain time they only need to be worn at night.

*Dr. F. M. Casto.*—The point I want to bring out is this: Whether or not the continuous wearing of the plate will interfere with the function of the soft tissues about the teeth, and whether or not this interference with the soft tissues may not change the secretions of the glands and make the teeth more liable to decay because of that fact. I wonder whether Dr. Hawley has noticed that particular thing.

*Dr. Hawley.*—You must remember that this plate is not worn continuously, and the effect of vulcanite on the mouth is nothing so far as I have observed. So far as the condition of the teeth and health of the patient are concerned, there is no one closely connected with me, who has been so delighted with this retention as Dr. Gearhart of Washington. He is a periodontist, and a great many of my patients go to him for treatment. During retention these plates can be slipped off and the teeth can be properly cleansed. They have noticed absolutely no effect upon the soft tissues from wearing the plate. As I have said, they are not wearing these plates continually. The night wearing of the plate does not affect the mouth.

*Dr. George B. Winter, St. Louis.*—If a child had the lateral incisors missing, I would like to ask Dr. Hawley how long the child could wear a plate of this nature?

*Dr. Hawley.*—I do not know. We supply these teeth during the retention period, and there comes a time when the missing teeth must be replaced. You can stop this retention when you please. If you reach the stage that you should want to supply a missing tooth permanently, a new plate must be made or the entire retention abandoned. That can be decided by conditions.

*Dr. Ralph S. Baldwin.*—In cases where the teeth are slightly rotated, with a tendency to be lingual to their normal occlusion, before the plate is waxed up, the lingual surfaces of the teeth on the model can be slightly cut away, and there will be an excess of rubber that will contract with the rotated tooth. After wearing the plate for a day or so, the tooth will be forced into the desired position. If you recognize that when you wax the plate up it will be more satisfactory than adding cement or other filler because naturally these wear away.

I have had several cases in which, when I took the apparatus off, the perspective looked almost perfect, but when it came to a more careful and minute examination I could determine to a fraction here and there that corrections should be made. In bending the wire on the labial surfaces of the teeth, if a tooth is rotated, it naturally causes an irregularity in the outside contour line, and this irregularity is sometimes shaved down

and the wire is passed squarely over it. When the plate goes into the mouth the labial wire will come in contact more strongly at that point where the plaster was cut down. By thus cutting and fitting and adjusting the plate accurately and forcibly with the bicuspid clamp, a great deal of the final and accurate finish of the work can be accomplished.

*Dr. V. E. Barnes, Cleveland, Ohio.*—Dr. Hawley made the statement that this appliance was not original with him; that it was Dr. McBride's idea. I used this appliance or a similar one for six or seven years, but have not employed it for the last four or five years because I found too much decay occurring under the plates. The temptation is too great to let the patient go for too long intervals between visits.

Dr. Casto raised the point as to whether the continuous wearing of rubber over gum tissue did not in some way deteriorate the tooth structure. I am inclined to think it does, but whether it is from irritation or change of function, or overheating or something of that sort, I do not know; but I do know that a tremendous amount of decay has occurred in some cases and the observation was not *post hoc*.

I have given up the use of the plate until I could get enough help to make a metal plate.

Before I leave the subject, I want to ask Dr. Waldron about one point. He stated that in putting pressure on the central incisor to the plate somewhere after this fashion (indicating), he put it far enough so that the pressure did not hurt and the tooth would be shortened.

*Dr. Waldron.*—If you have rounded central incisors and get above the portion with the plate up high on the lingual surface, there is pressure in that direction (indicating on blackboard), while resistance is exerted in the other direction. That is not any particular gain.

*Dr. Barnes.*—That can not happen in any case. The plate will drop by the force of gravity because there is nothing to hold it unless the plate is held around the tooth. If you want to put that amount of pressure on, you should have small attachments, metal pieces, such as we put in between plates like these and drill a hole in the plaster cast and put in a pin and force this down the proper distance. If you put this on both sides we get a locking device by the constriction of the tooth below the crown. If you have enough of these you may get slight pressure at this point (indicating). If you put that kind of movement on this device, that tooth would lift the plate, and something is wrong with your technic.

*Dr. Waldron.*—No, not necessarily. You have a clasp go around the cuspid and bicuspid which will go into the model with a positive snap. The proof of the pudding is in the eating. I have had these things happen, and Dr. Hawley has had them happen. It is due to that particular shape. I have never had it happen where the labial third of the tooth was in normal shape.

*Dr. Barnes.*—It is more important that the bicuspids should elongate than that the incisors shall go up.

*Dr. Waldron.*—The occlusion will not allow it.

*Dr. Barnes.*—The use of a biting plate progresses most satisfactorily wherever we obtain a bite. This (indicating) represents the planes of the upper and lower teeth. This method opens the bite and it later closes in the back. We do not get the result we think we get, and later if we take the plate out we have the overbite reestablished again. We corrected that in this way: We built into the plate a section of metal or rubber which reproduced the occlusal surfaces of the first molar in relation to the bite plane so that the amount of range at this point (indicating) was equalized by the rest here. The tooth here and there and the second molar are elongated. After that is established for a long time, your occlusion might become established. Later on, you can cut off the surface of this tooth and this lower tooth will elongate and you establish occlusion as it was. We have had considerable success in doing that.

We have later used that principle in another type of retention, and it is essential in opening the bite because you depend upon this part of the bite opening to sustain it by another area, so that instead of shortening the tooth you elongate this tooth. Your

metal opening must sustain the stress of mastication until the other teeth elongate, or your bite opening process it not a success.

The great difficulty with all these appliances depends upon whether you can trust your patients to wear them. After you have worked on a case for two or five years you want to be pretty sure you can trust a patient with a removable apparatus of this kind. You are putting your experience and your work into that patient's hands. If he can be trusted, all right. If he can not, don't use that kind of appliance. We find very often we can get adjustment in a local area which we could not get by these little labial wires, so that by cementing or soldering on little pins and little cross pins, you can put tension on a tooth which will check rotation or rotate it if you want that done. These little pins need not be made of heavy metal. They must not be very long, not over one-eighth of an inch. Even that is too long for certain cases. There must be some slight range of adjustment which must have slight tension, but they give you an adaptability greater than horizontal wire.

*Dr. Waldron.*—The great problem with all these appliances is whether you can trust your patients to wear them. After you have worked on a case for two or five years, you want to be pretty sure you can trust a patient with a removable apparatus of this kind. You are putting your experience and your work into that patient's hands. If he can be trusted, all right. If he cannot, do not use that kind of appliance. We find very often that we can get adjustment in a local area which we could not get by these little labial wires. By cementing or soldering on little pins and little cross pins, you can put tension on a tooth which will check rotation or rotate it if you want that done. These little pins need not be made of heavy metal. They must not be very long, not over one-eighth of an inch. Even that is too long for certain cases. There must be some slight range of adjustment which must have slight tension, but they give you an adaptability greater than horizontal wire.

*Dr. C. A. Hawley (closing).*—Dr. Waldron spoke of using these devices on deciduous teeth. I have not tried it because my whole energy has been fixed on the question of retaining a complete denture.

Dr. Abell asked about the mobility of the anterior teeth. My impression is that the anterior teeth are less restricted and more mobile. At any period practically all stress is removed from the anterior teeth.

So far as the correction of the overbite is concerned, I have found in my own experience no such difficulty as Dr. Barnes has described. I do not know that I could describe just exactly what takes place in such cases. My idea is that the bicuspid and molars move down bodily to complete occlusion and the alveolus and soft tissues of the mouth with them, but later there is reciprocal adjustment of both the anterior and posterior teeth.

The small pins Dr. Barnes spoke of, soldered to the bar, in my experience are unnecessary. I am giving you my experience; I am not at all arbitrary about it, but I have not found these pins necessary.

Dr. Barnes says he has had trouble with rubber plates irritating the soft tissues. You may have that trouble with a rough porous plate. I emphasized in the paper the desirability of vulcanizing the plates on a heavy tinfoil which produces a hard smooth surface which is not irritating.

The most important objection to a removable retainer is the question of the patient's losing it. I have put in something over two hundred. I have had three patients who lost their plates. In one case a girl called me up saying that she was going away to a boarding school. She called me an hour before her train was to start, stating that she lost her plate. She went off and came back four months later, saying she had found it about three weeks afterward, and the teeth were all right. Another patient, a young man in the army, lost his plate last June, and I have not seen him since. Another boy going to school sixty miles from Washington lost his plate, came into the office the next Saturday. I took an impression, and the following Saturday put in the plate, and all went well.

I would rather make each patient five of these plates to guard against loss than to leave them with fixed retention.

My experience has been that there is less irritation of the soft tissues and less injury to the teeth with these removable retainers, than there is with fixed retention. The patients will occasionally lose a plate; there is no question about that, and there will be some cases in which the soft tissues are injured by any retainer, and all retention has objections. If we could make our corrections and take off our appliances and dismiss the patient, and the teeth stay exactly where we place them, that would be ideal, but we know they will not and there is no retention that does not have certain objections.

There is one feature of this retention that I do not know whether you fully grasp or not, and I bring that out by asking you this question. Is there a man here who can tell me how long any case needs retention? Can any of you with the longest experience tell within three months of the time a case will need retention? I do not believe there is one of you who can do it. What do we do? We put in a retainer and guess at it. We get the patient to wear it as long as we can and in two or three years we take it off. Do these teeth stay? They do not in most cases. It may not be serious enough to take up the case again and re-treat it. But suppose you do take it, as I have done, and treat it again. Do you know any more the second time than you did the first?

The most important question is: Can you retain a tooth from rotation with a removable retainer? I know you can, and you have something there that relieves the patient also from the appearance of a fixed retainer. They can keep them for years. You can abandon it whenever you please. You can take off the retainer for a certain time, but you have a check against adverse movement for many years.

Here is another advantage. Some patients, many of them, want to appear, at least for a few hours, without anything on their teeth, and the removable retainer is a source of great relief to them. I have had a number of patients say to me: "If you can regulate my teeth and can retain them so that I can once in a while appear without any bands on the teeth, I am willing to have it done."

*Dr. F. M. Casto.*—I was a little suspicious that these plates might have a deleterious effect on the soft tissues, and those suspicions have been confirmed, because I have noticed in the examination of this model that there has been a great change in the tissue. I do not know how long this appliance has been worn. I would like to have Dr. Hawley explain the changes that have taken place.

*Dr. Hawley.*—It is one of Dr. Waldron's models, not mine, so I will pass it around. (Laughter.)



## THE INDIVIDUAL NORMAL—THE PROBLEM OF ORTHODONTIA\*

BY A. LEROY JOHNSON, D.M.D., SPRINGFIELD, MASS.

THE growth of a science is due to an accumulation of facts. No opinions, beliefs, or convictions, even though advanced by men otherwise highly deserving, can take the place of real and sufficient evidence. At times, science progresses by flashes of intuition, yet more often, its progress is due to the patient and careful unveiling of facts by systematic research. Clinical experience, based upon rather indefinite doctrine, has carried us far enough to put beyond doubt the value and need of orthodontic treatment to many individuals; nevertheless, if orthodontia is to grow and become of practical service to humanity, it will be the result of scientific investigations of actual conditions, research which follows the truth wherever it may lead.

We have been attempting to build a science upon an ideal. An ideal scheme of the occlusal relations of the teeth we have called "normal occlusion." Such a conception as this has been the basis of our diagnosis and treatment; in fact, at the present time, it is finding expression in the endeavor to solve the problem of the correction of malocclusion of the teeth by means of a mathematical formula. However, though the developments of the future establish the value of mathematical analysis as a step in diagnosis, a conception of the problem of orthodontia as purely a mechanistic one is without scientific justification. It is for the purpose of defining the normal and indicating the way to approach the question of malocclusion of the teeth of the human individual that the considerations of this essay are presented. The subject matter treats of a problem of so fundamental a character that it seems advisable to present briefly the conception of the nature and purpose of orthodontia which has resulted in the seemingly unorthodox point of view.

The concept of the normal dental arch is the foundation of modern dentistry. Although the dental arch is often referred to as being composed of the teeth and their supporting structures, a dogmatic definition of it does not convey a true idea of the nature of the conditions which surround all dental operations. The concept of the dental arch is not limited to a study of the morphologic characteristics of the teeth together with their supporting and surrounding structures; it is more comprehensive. It is a concept derived from a study of the action, reaction, and interaction of different elements of the dental arch in the continual adjustment of life; it is a concept of the nature of living tissues as they stand in physiologic correlation. The structural elements of the teeth; the osseous, nervous, vascular and muscle tissues of the face and jaws intermingle and blend into one another and are controlled in their mutual relations by the more dominant influence of factors involving the entire organism. The line of demarcation between the dental arch and the other tissues of the living organism is not definite. Living tissues blend through an intermingling of structural elements,

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while the central nervous system and the circulatory system, the avenue of the internal secretions, maintain the fundamental unity of the organism as a whole. The purpose of dentistry is to assist in establishing and maintaining the normal functional activity of the living dental arch. Hence the ultimate success of dental operations is not determined by their relation to tooth structure alone. All work upon or within the teeth involves living tissues which stand in physiologic correlation with other tissues of the living organism.

Orthodontia is ordinarily defined as "that science which has for its object the correction of malocclusion of the teeth."<sup>1</sup> Such a definition is of little value because it does not convey an idea of the nature of the problem involved in the correction of malocclusion. We believe it to be nearer the truth to define orthodontia as that branch of dentistry which treats of the forces controlling the form of the dental arch. This indicates in a general way, at least, the extent of the phenomena to be considered in diagnosis and treatment. The form of an organ or part is the result of an interaction of forces; it is the result of the interaction of function and structure. Structural form can not be accounted for by environmental factors alone, neither can heredity explain away all variation. It is the interaction of one with the other, the combined influence of the extrinsic with the intrinsic which determine the form of structures. Therefore the subject matter of the science of orthodontia is derived from the two phases of biology, heredity and environment, and is, in the main, a study of the fundamental truths and laws of science as they are expressed in the growth and development of the dental arch of the living human being; and the relation of these truths and laws to specific abnormal structural conditions. Orthodontia is essentially a science of form development.

From such a standpoint as this, the field of orthodontia broadens beyond a study of occlusion. Inasmuch as the teeth are the primary factors in the evolution of the dental arch, and the principle function for which they exist lies in the physical relations of their crowns, the study of occlusion constitutes a large part of the science. It is, in a degree, an index of the developmental condition of the adjacent structures of the teeth and a register of the forces acting upon them.

Orthodontia is concerned with a collection of structures of different origin, varying in developmental nature, reacting to different influences, yet organized for a common purpose. The occlusal relations of the teeth constitute but one element of a complex of structures interdependent in life, and subordinate in evolution to the organism as a whole. Nowhere in the living organism is there an instance wherein parts of such diverse character are more closely associated or more dependent upon each other than in the dental arch, and it is the purpose of orthodontia to so treat these diverse elements, directly or indirectly, that they will express, individually and collectively, the normal development of the individual organism.

The difference in the developmental nature of the teeth and adjacent structures is a characteristic of the dental arch most significant in the study of malocclusion. Enamel is derived from the ectoderm, while muscle and connective tissue structures are derived from the mesoderm. The dental bulbs appear as shallow inverted cups and beneath their centers is found the condensed connec-

tive tissue which gives rise to the body of the tooth, the dentine. The primitive dental bulb is projected directly into the embryonic connective tissue, which underlies and covers the tooth band on all its free surfaces.<sup>2</sup> Ectodermal epithelium pushes into the embryonic connective tissue and the enamel organs thus formed are of such a different nature and are susceptible to such an entirely different set of influences that they mark the slightest variation in the development of the connective tissue structures. The crowns of the teeth are completely developed in adult form long before they function in mastication and in use they wear away, while bone, muscle, vascular and nervous tissues depend for their complete development upon the stimuli of function. This wide difference in the developmental characteristics of the tissues which compose it, make variations in the form of the dental arch more obvious than in other parts of the organism where the tissues are more nearly of like nature. For this reason a scientific interpretation of the normal is more essential in orthodontia than in other fields of orthopedia where the structures are, in a greater degree, molded and harmonized by function in the ordinary activities of life. In fact, the fundamental problem in orthodontia is to determine the normal dental arch of the individual organism. It is a problem of the individual as distinguished from class, group, or species and as such is inseparably linked with the phenomena of variation.

The most obvious thing about the individual organism is its variability.<sup>3</sup> Variation in form and function is universal among living beings. Although two individuals will resemble each other, possessing certain characters in common, yet invariably upon close examination these characters will be found to differ from each other in degree or in proportion. Differences extend to minute particulars and include all characters, function as well as structure, internal organs and parts as well as external proportions. No part of the living being escapes the influence of the law of variation. Hence an interpretation of the normal as it refers to the dental arch of the individual organism must find a basis in this law and must be determined by the methods employed in the analysis of the material relative to it.

The question of the normal has been handled as though it were only a problem of species. The attempt has been made to establish an imaginary line, called the "line of occlusion," as a criterion by which to determine the existence or nonexistence of malocclusion and deformities of the dental arch.<sup>4</sup> Twenty years or more have passed since Dr. Edward H. Angle first defined the line of occlusion, yet for many the question of the normal is still unanswered. In owning that it is so, we do not honor Angle's work the less, for whatever value the future may assign to the line of occlusion in diagnosis, it will always be remembered that it was through the work of Dr. Angle that the problem of malocclusion was first studied as a problem of science. If he did not solve the question of the normal in his early writings, he gave the hope of its solution, undoubtedly, a greater thing.

The endeavor to utilize the line of occlusion as a standard by which to determine the normal involves a contradiction. As has already been emphasized, orthodontia is concerned with the dental arch of the individual organism while the line of occlusion is based upon a consideration of type. The contradiction lies in the assumption of an individual type.

Type is a word that has been used very loosely, but literally interpreted, it refers to a general form or plan of structure common to a number of individuals. It is the ideal representation of, or the most perfect exemplification of, a natural group. It is a composite of individual forms. An individual is not referred to as a class, neither is an individual a type, in either case the individual is but a unit in the composition of a class or type. I quote from Davenport<sup>5</sup> a concrete case which will best illustrate the principle involved. "A random sample of Leaming corn, consisting of 327 ears gave the distribution as to length as illustrated in Fig. 1. It will be noted at once that there are more ears of 9 inches than of any other length, and that the distribution decreases in both directions, but unequally, from this highest frequency. This highest frequency, or most common length, shows clearly what is the prevailing type as to length in the crop, and it is held by statisticians to be the best obtainable expression for type. When it is ascertained, therefore, we know at once what is the natural type of the race or variety so far as the character in question is concerned, and when this is determined for a number of important characters we shall have



Fig. 1.

a good knowledge of the racial type as a whole. But in obtaining the mode of another character as circumference or weight, the ears tabulated as typical will not necessarily be the same as those which constitute the group of highest frequency in a study of length." Consequently, "while we might obtain the mode of the circumference, number of rows, weight of ear, or any other desired character, and having done so are able to describe definitely a typical ear," it should be clear that the typical is not a concrete thing, existing in natural form, but is of the nature of an abstraction, a model or pattern from which the individual presents some degree of variation. The word type used with individual refers to certain marked racial characteristics which the individual possesses. It directs attention to certain traits or features which are common to different individuals. It can not in any sense apply to the individual as a specific standard of normality, for there is a great range of individual variation without departure from type.<sup>6</sup>

Furthermore, the concept of the line of occlusion embodies the idea of the teleologists who believed that normal organs and parts express the most per-

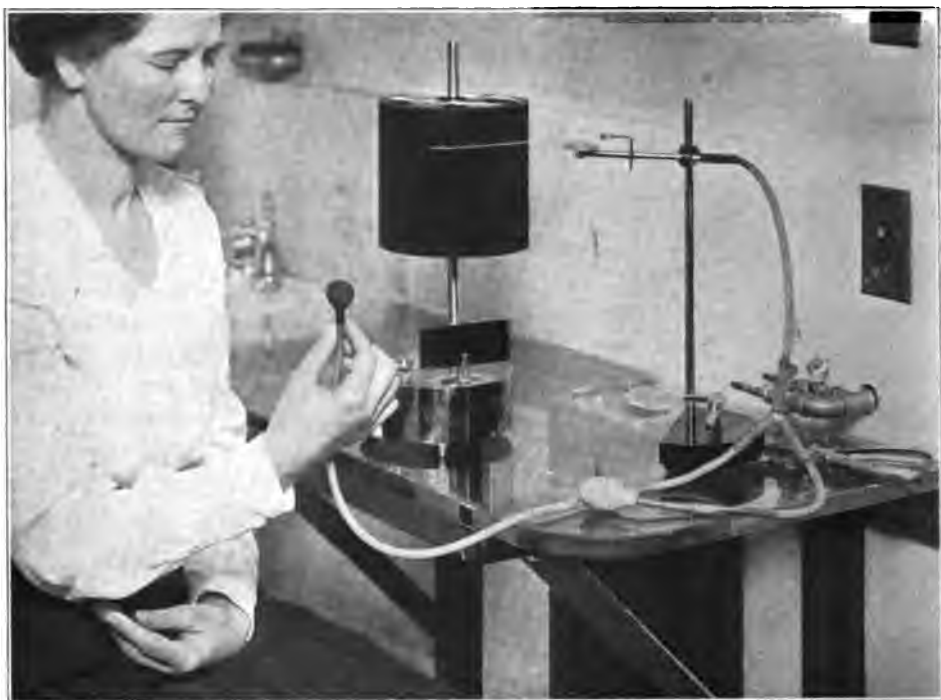


Fig. 2.



Fig. 3.

fect means of performing the function for which they exist. This theory has long since been abandoned. Huxley says that teleology, as commonly understood, received its death-blow at Darwin's hands.<sup>7</sup> Darwin simply affirmed that organs and parts work well enough to enable an animal to survive, but admitted the possibility of improvement in their form and function, and his opinion holds true today.

Therefore in the face of constant variation and incompleteness, it is evident that the normal as it applies to the individual organism can not be deter-

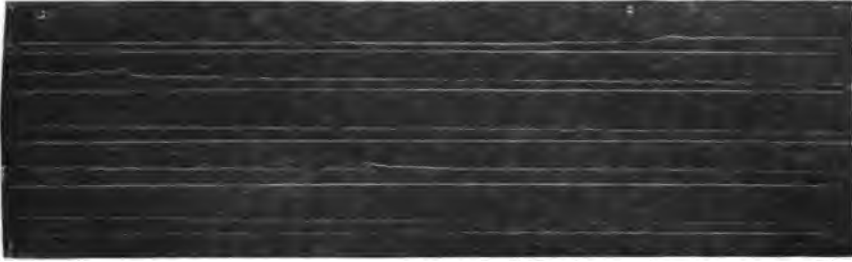


Fig. 4.



Fig. 5.

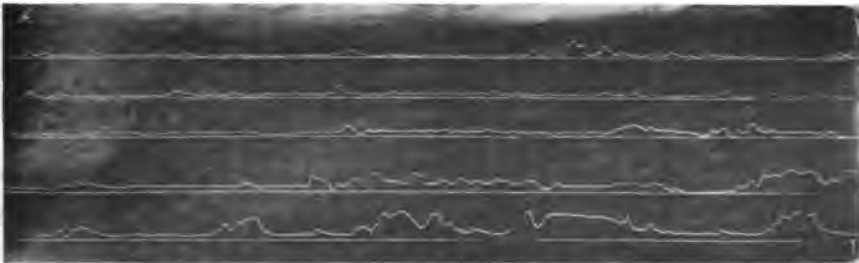


Fig. 6.

mined by a study of type taken of itself alone or of structural perfection. If the typical is utilized as a definite standard of normality of the individual and all variations from it classified as abnormal then the normal individual does not exist. It is not reasonable to base our diagnosis upon a concept which can never be realized in natural forms.

The scheme of occlusion expressed in the ideal relations of the inclined planes of the cusps of the teeth is a working hypothesis; it is a theory to be adopted as a guide in an investigation of the real nature of occlusion. A hy-

pothesis is not proved; it is assumed to account for a fact or an occurrence. If you were to determine the ingredients of a chemical compound, a general knowledge of its kind or character would decide the methods to be employed, and each succeeding process would be the result of an assumption or theory that such pro-



Fig. 7.



Fig. 8.

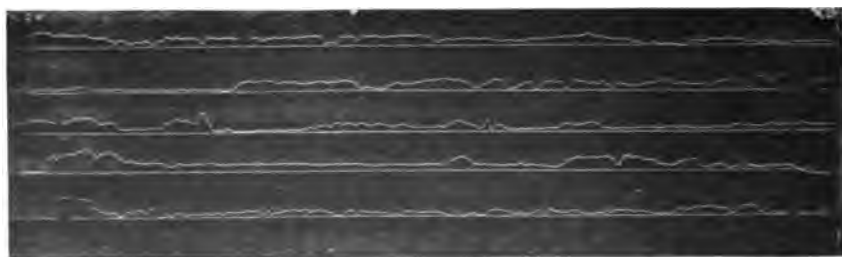
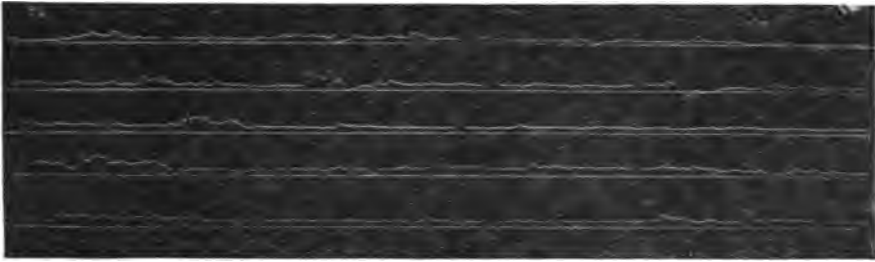


Fig. 9.

cedure would reveal one or more of the constituent elements of the compound. In other words, in chemical analysis a theory which has a basis in fact, is the assumption, the belief, the hypothesis which leads to the investigation that reveals the real nature of the phenomena in question. A hypothesis leads to facts; it does not express actual conditions already established. The ideal scheme of occlusal

relations commonly called "normal occlusion" is a concept derived from a study of the law of occlusion, and is the mental picture, the working hypothesis, essential in an investigation of the nature of occlusion, as it is in the mouths of men today. Such a concept furnishes the groundwork for a study of the facts, the real evidence which constitutes so vital a part of the subject matter of orthodontia.

**Fig. 11.****Fig. 10.****Fig. 12.****Fig. 13.**

The word "normal" means a resultant of correlated factors. As it is used in orthodontia, it refers to either one of two classes of phenomena; either to the general form of a character as seen in a group of individuals or to a complex of the individual organism. The former signifies a correlation expressing the typical form of an organ or part as seen in many individuals; the latter



signifies a correlation which is best suited to the life activities of the individual organism as a whole. Hence, in the study of occlusion then we are concerned with two groups of phenomena, the *species normal* and the *individual normal*.

The species normal is a concept derived from the observation and comparison of the occlusal relations of the teeth of many organisms. It is the result of combining, of bringing together in one concept a variety of structural con-



Fig. 15.



Fig. 14.

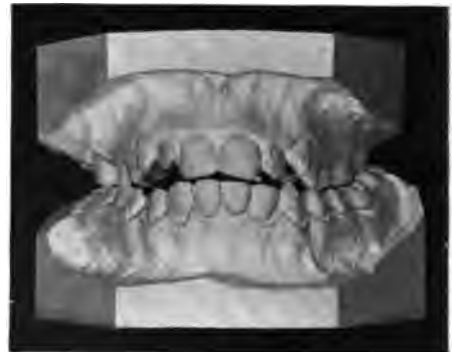


Fig. 16.

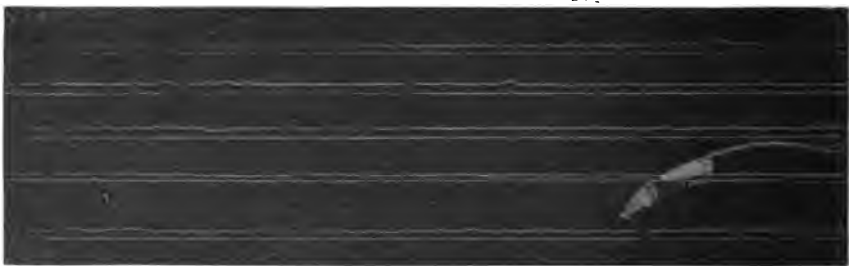


Fig. 17.

ditions, each different from the other, no two alike, as illustrated in the study of the typical ear of corn. The species normal might be considered as a composite of the occlusal relations of the teeth of many organisms. If it were possible to make a composite photograph of the occlusal relations of the teeth of a group of individuals from all angles, the result would portray the typical occlusion, the species normal.

The word "normal" in the phrase "species normal" refers to the resultant of a correlation of structural conditions. In much the same sense, R. E. Lloyd<sup>8</sup> uses the word "normal" as the majority. The word "species" is chosen for its literal sense. Although it is often used to designate an aggregate of individuals, varying around a normal type, such is not the strict interpretation of the word. Many species that were once thought to be distinct from one another have later

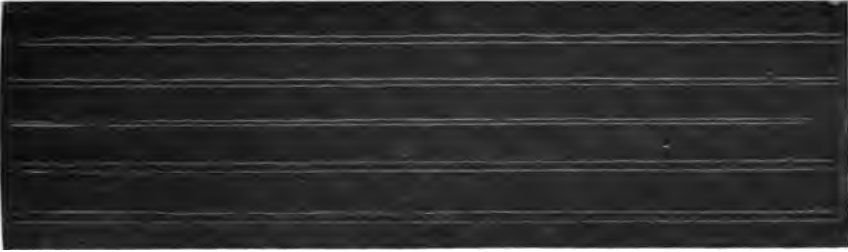


Fig. 19.

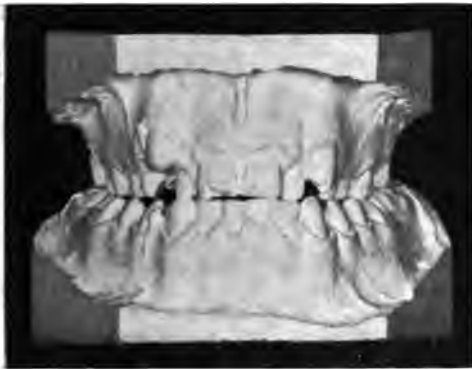


Fig. 18.



Fig. 20.



Fig. 21.

been united by the discovery of intermediate forms. Perhaps the most notable instance illustrating the arbitrary character of the grouping of the species, is where two animals which were at one time classed as belonging to different species were later proved to be male and female of the same. Of course, it is true that at a given time, the forms of living things may be arranged in specific groups, and between the immense majority of these there are at the present

time no transitional forms. However, we know from the law of variation that even the characters which determine the grouping together of certain individuals are not identical but vary in some degree, in some way from each other. It is with these variations that we are concerned in orthodontia. In its most literal translation, species means an abstract form, an abstract condition of occlusion, if you will, around which a group of variations oscillate.<sup>8</sup> It is in this sense



Fig. 23.

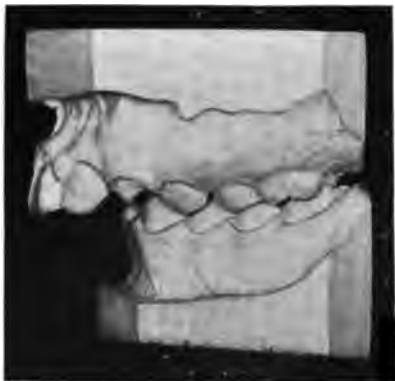


Fig. 22.



Fig. 24.

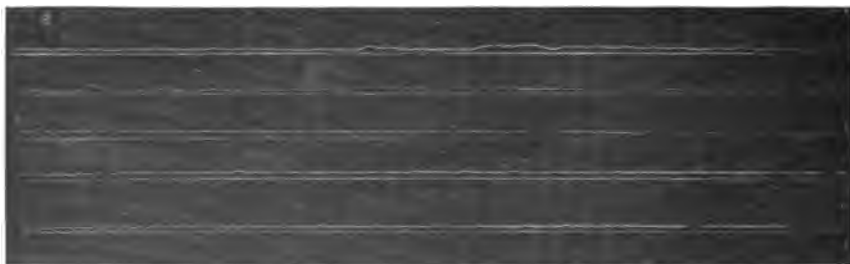


Fig. 25.

that it is used in the phrase "species normal." It seems better to convey the idea of the typical in this way than to employ the "collective normal" of the psychologist. Species although used synonymously with typical seems preferable as it contrasts more clearly with individual.

The "individual normal" is the result of the correlated activity of many parts of the individual organism.<sup>10</sup> It is the result of a complex of physiologic

processes. The Individual Normal refers to the form of occlusion best adapted to the needs of the organism as a whole. It refers to the condition of occlusal relations which is the most effective in maintaining in its most stable form the equilibrium expressed in the life phenomena of the individual organism. It may or may not approximate the species normal. It is not an artificial creation built upon an ideal plan. It is the most perfect condition of occlusion that the



Fig. 27.



Fig. 26.



Fig. 28.

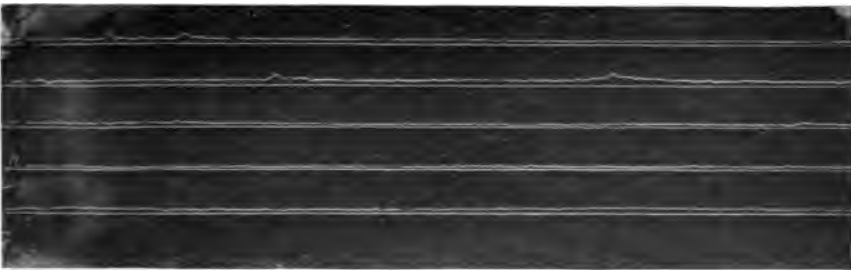


Fig. 29.

nature of the tissues and the functional activities of the organism as a whole will permit.

The dental arch is a mobile equilibrium reflecting the inheritance and life activities of the individual organism as a whole. To know when the form of a dental arch is normal for a particular individual is a difficult problem, and its solution, which is so vital to orthodontia, involves a consideration of the funda-

mental principles and laws of science. There is no short cut to a solution of the problem of deformities of the dental arch.

A science in its growth passes successively through the speculative, the qualitative, the quantitative, to the predictive stages of development.<sup>11</sup> As a result of speculation, qualitative work is done, and from the general principles thus established, quantitative methods can be evolved which, in a varying degree, will make prediction possible. Much qualitative work is necessary in orthodontia before it can lay claim to quantitative methods of procedure. A statistical study to ascertain the typical occlusion, the species normal, of man is yet to be done. Although a most perfect occlusal relation may have been born in the race, we do not know enough of the true nature of occlusion as it is today. Of course such an investigation would be a difficult and tedious task. In fa



Fig. 30.



Fig. 31.

it is futile to suppose a very fine degree of accuracy in recording observations of this nature. Yet research of this kind is one of the first essentials in establishing orthodontia in science. General principles derived from studies of groups and species are indispensable in a study of the individual organism. They are indices to individual characters.

Much of the evidence in the following illustrations is still obscure. The studies of it have not been carried far enough to establish its full value. Yet certain tendencies are sufficiently clear to justify a preliminary report. No further claim is made than that the evidence in its present form points to a correlation of a physiologic nature and indicates one of many ways to approach the question of the individual normal. The study is of involuntary tongue movements.

The apparatus used is patterned after that of E. W. Scripture in his work on Stuttering and Lipping.<sup>12</sup> It consists of a kymograph and tambour which is connected by rubber tubing with a very delicate rubber bulb (Fig. 2). The bulb is inflated by forcing air through the auxiliary tube. When this is done, the recording needle is raised as shown on the drum. With the patient holding the tube in the hand a base line is recorded upon the smoked paper. Then the end of the tube is held firmly between the incisor teeth, placing the bulb between the tongue and the hard palate. The patient is told to allow the tongue to rest against the bulb, and the following tests are made, each one being preceded by marking the base line and all are of one minute duration: First, subject sitting still looking out of window; second, reading to himself; third, cutting figure out of paper as seen in Fig. 3; fourth, writing verse of song with pencil upon back of paper; fifth, repetition of first. Approximately two hundred charts have been made. Figs. 4, 5, and 6 will give an idea of the variations met with. From the anatomic structure of the tongue and its involuntary character, an irregular line might well be anticipated. But the difference in the character of the lines and the relation of this difference to the structure of the dental arch is at least significant. The charts were classified according to their general character, without consideration of sex and very little regard to age. Of course the class distinctions were not absolute, there being transitional records in all instances. However, certain things were evident. The majority of the charts of patients with the overbite form of malocclusion were in the same class. They were characterized by an irregular tongue line which dropped to and often below the base line. While this was not seen in all of the cases that, from a study of occlusion alone, would be classed as overbite cases, it has not as yet occurred where other forms of malocclusion were present.

Fig. 7 is malocclusion associated with Fig. 5; Fig. 8, malocclusion associated with Fig. 9; Fig. 10, malocclusion associated with Fig. 11; Fig. 12, malocclusion associated with Fig. 13; Fig. 14, malocclusion associated with Fig. 15. The last case is particularly interesting in its similarity to the others from the fact that the patient is from six to eight years older.

The open bite cases and those with the relatively short overbite show the tongue line well above the base line.

Fig. 16 is malocclusion associated with Fig. 17; Fig. 18, malocclusion associated with Fig. 19; Fig. 20, malocclusion with Fig. 21; Fig. 22, malocclusion associated with Fig. 23.

The cases illustrated in Figs. 20 and 22 have responded to treatment without difficulty, while Figs. 8 and 10 are quite different. The teeth move easily but there is a constant tendency to relapse.

Fig. 24 is malocclusion associated with Fig. 25; Fig. 26, malocclusion associated with Fig. 27; Fig. 28, malocclusion associated with Fig. 29; Fig. 30, malocclusion associated with Fig. 31.

Note rhythm in the tongue line of Figs. 24, 26, 28 and 30. In each of the first three cases the incisors would push forward unless appliances were worn intermittently. It will be obvious to many that the absence of a gauge to register the pressure of air in the rubber bulb admits an element of error in the records. This is, of course, also true of the condition of the rubber on the tambour and

bulb. But recognizing all this, the fact is that the rhythm evident in these three charts was not seen in any of the others. What further study will reveal I can not say.

Fig. 30 is associated with Fig. 31 which is a chart of a boy with chorea manifest in the superficial muscles around the orbits.

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#### DISCUSSION

*Dr. John V. Mershon, Philadelphia, Pa.*—After reading Dr. Johnson's paper many times, I feel that it is a mistake to discuss it. I consider it so near a perfect presentation of facts that to add to it would be impossible, so my remarks should not be considered a discussion. I am only going to call your attention to some facts and emphasize what seem to me to be very important.

The whole trend of Dr. Johnson's paper is to show that we have been undertaking to work an ideal which does not exist, that is our past conception of the ideal normal occlusion, and he has given us the correct standard to which we can work, and a basis on which to start to study. The study of the individual normal must be measured by the functional activities of the forces of development. Dr. Johnson has very properly called our attention to the fact that the orthodontist can no longer depend on the morphologic characteristics of the teeth, and their supporting and surrounding tissues, but that we are dealing with a portion of the human being, and that the mouth and all the organs which compose the oral cavity are just as much a part and parcel of the human being as the lungs, the liver or any of the other organs, and are affected by the internal conditions both in its growth and development, and we must treat the individual as a whole.

Dr. Johnson's definition of orthodontia is a great improvement over anything we have had previously, he defines it as that department of dentistry which treats of the forces controlling the form of the dental arch. Later on in the paper Dr. Johnson, in referring to normal variations, states that these variations are not confined to the osseous tissues in which the teeth are located. We have the same variation in the form and size of the teeth, as nearly all tissue form depends on function. The teeth are formed before they begin to perform the function for which they were originally designed. These facts would seem to prove conclusively the fallacy of undertaking to predetermine the size and shape of the dental arch purely by measuring the tooth material, and entirely disregarding the forces which operate through function to produce form.

Dr. Johnson has also shown us that arch form is of the individual normal. It would be interesting in studying these slides which Dr. Johnson has been showing, if we could have an analysis of the individuals from which these records were made, as to what deformities may exist in the other parts of the body. The story told by these slides seems to be very closely related to the work done by Dr. Johnson and Dr. Hatfield on muscle development. In their investigations they showed the relationship between the lowered muscle tone and bad osseous development. These records which Dr. Johnson has been showing are another connecting link between a certain type of osseous deformity represented by a certain type of malocclusion which expresses itself indirectly through the nerv-

ous system by the way of the involuntary muscle fibers in the tongue which are responsible for the variations shown on the records. In both of these investigations it simply goes to prove that malocclusion is only a local expression of a general constitutional condition. The result of these investigations should further impress us with the facts that orthodontic appliances are not the only prescription necessary in the treatment of malocclusion. A great deal more importance should be attached to the value of these investigations than Dr. Johnson seems willing to admit. I think this society should be congratulated that we have men who are willing to spend the time and energy necessary to make these investigations and give them to us absolutely free, such as Dr. Johnson has been doing this year and last year.

*Dr. William C. Fisher, New York City.*—I find there is very little left for me to say after the paper of Dr. Johnson and the discussion of Dr. Mershon.

Dr. Kemple said that Dr. Johnson wanted me to discuss his paper. He spoke to me at a meeting of the Academy of Medicine in New York about it, and I thought he was poking fun at me, and I so told him, and I still believe so. After I had read the paper, I did not believe Dr. Johnson wanted me to discuss it. Dr. Johnson and I had dinner together and during that dinner he outlined the salient features of his paper to me and showed me some of these slides.

His paper is a little different from the one he gave me. "If the typical is utilized as a definite standard of normality of the individual, and all variations from it are classified as abnormal, then the normal individual does not exist." That is the meat of that particular part of his paper. Typical and normal do not *mean* the same thing; they can not *mean* the same thing and they can not *be* the same thing, but unfortunately many have frequently confused them into *meaning the same thing*.

Dr. Johnson spoke of the influence of heredity. How many of us, when our little patients come in, make concrete models and immediately base our diagnosis on them, outline the appliance to be used, have it made, and put it back on the patient? And that is as far as we have gone in our diagnosis. How many of us look into the antecedents of the child, and how many of us think what the normal for that child should be? Nine times out of ten even the most conscientious of us have unconsciously in our mind's eye the so-called normal arch type, and we do not consider the child. This leads to the point I would like to bring out which I get from his paper, namely: How will this affect our work? That is what we want to get out of all papers presented here. What difference will it make in our treatment of cases? To me it has a very important bearing on the treatment of malocclusions of the deciduous teeth.

I was asked the question in this meeting recently, "What would be your treatment of a child between five and six years of age where there is pronounced malocclusion?" My answer was that in the majority of cases I would condemn the orthodontist. I do not believe that we are warranted in interfering with many of the deciduous malformations for the reasons brought out in Dr. Johnson's paper,—study the individual normal. We can not possibly tell exactly and know in what direction a child will develop, what the normal of that child can be, later when seen at the age of four or five years. The parents and the relatives of a baby at the first and second year will tell you and admit to you that the child is a living image of the mother. By the time that child reaches five or six years of age it is so absolutely changed in its appearance that it may resemble the father and have no resemblance whatever to the mother. As time goes on and the child develops it may lose its resemblance to either one of the parents and may take on the resemblance of one of the grandparents. Changes occur in the families where you study the physiognomy of the children. With that point in mind, how can we determine the treatment of these deciduous cases? In my own practice I have for a long time confined orthodontic interference in malocclusion of the deciduous teeth to the expansion of the inferior cuspid region, and that only rarely.

To know the individual normal is to know your science. In other words, it can not be laid down by rule and compass, but can be realized only by years of experience.

*Dr. B. E. Lischer, St. Louis, Missouri.*—I hesitate to discuss this very interesting paper extemporaneously because it is a philosophical dissertation on fundamental problems.



Dr. Johnson made the statement in the first paragraph of his paper that if orthodontia is to be of practical service to humanity, we will have to study this subject. I would like to insert the word *more*. The fact that we are here today is proof that we have been of *some* value to humanity. That, however, is a minor criticism.

He has called our attention to the factor of *variation*. The study of variation, as I understand it, has led to the concept that *variations* are of *germinal origin*; they are congenital. But there is another subject in connection with this matter that requires our attention; namely, *modifications*. These are wrought in an individual's lifetime, are *soma-togenic*, or *acquired*. Many modifications can be found in the facial features; I refer particularly to those due to the anomalies of dentition. And while I would not detract one iota from the imperious hypothesis of occlusion, I want to call your attention to the fact that we will shortly have to study in greater detail the facial modifications of our patients.

For several years I have taken life size photographs of the face of every patient that comes to my office, and I find these are of great value to me. I have reference particularly to the facial features that are involved in the orthodontic treatment, and I have been amazed at the many variations and modifications that we are confronted with. I am convinced that many of our preconceived theories will have to be exploded.

But as I have previously said, I am not prepared to discuss this paper as I should like to, and I want to thank Dr. Johnson for its very able presentation. It seems to me that it opens up tremendous possibilities.

Dr. Milo Hellman, New York City.—I shall discuss Dr. Johnson's paper, for it merits

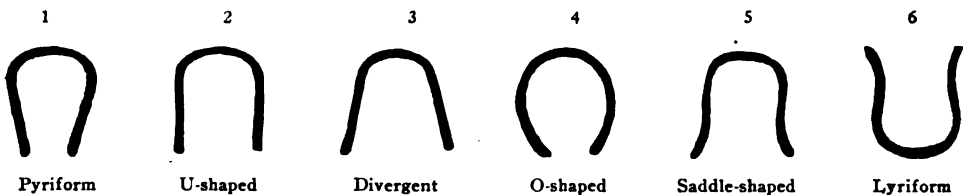


Fig. A.—Illustrating diagrammatically the various forms of the dental arches of the Anthropoid apes.

discussion. In doing so, however, I shall touch upon one point in order to bring out in a concrete form a suggestion Dr. Johnson has passed by so lightly. And that is the remarks made relative to the mathematical calculations employed as predetermining factors for the various dental arch forms.

If you will permit me to show one or two diagrams which I have used in connection with a paper read before the Alumni Society of the Dewey School of Orthodontia, I shall bring forward some comparative evidence bearing upon this topic.

If the contention is correct that the dimensions of the teeth will predetermine the form of the dental arch in man, the evidence obtained from comparative studies would verify it. With this end in view, I examined a number of anthropoid apes, comprising all the genera included in the family. These are the gibbon, the orang, the gorilla, and the chimpanzee. The skulls of the apes examined belong to the collections of the United States National Museum of Washington, D. C., and the American Museum of Natural History of New York. While the teeth of the anthropoids themselves bear a close resemblance in form to those of man, with the exception of the canines and lower first premolars, the arch forms differ considerably. However, the form of the dental arches may be classified under six main types. These are the pear-shaped, the inverted U-shape, the divergent-shape, the oval-shape, the saddle-shape and the lyre-shape. (See Fig. A.) Each dental arch in the anthropoid series must fall under one of these forms. But there are generic differences in the prevalence of arch form and the frequency of their appearance in each group. Thus, the gibbon presents the arch forms under 2, 3, 4, 5, 6; the orang, under 1, 2, 3, 4, 5; the gorilla, under 1, 2, 3, 5; the chimpanzee under 1, 2, 3, 5, 6. Moreover, each genus exhibits a preference for a certain type of arch form. In the gibbon, the upper arch form most frequently noted is the lyriform; appearing in 73 per cent of

cases. In the orang, the ypriform appears in 38.5 per cent; in the gorilla, the U-shaped form appears in 46.1 per cent and in the chimpanzee the lyriform appears in 40 per cent of cases.

If there is any relationship between the size of the teeth and the form of the arch we should find similar sized teeth in a particularly shaped arch. That is to say, if we take the 73 per cent of cases in the gibbon that fall into the lyriform arch, the central incisor of each of these cases should be of uniform size, or taking the combined dimension of all they should at least have a higher average than the central incisors of the cases belonging to all the combined other forms. This should be evident if there is any definite correlation. But actually it was not so. On measuring all central incisors belonging to the lyriform arch they were found to vary; and averaging their dimensions, it was also

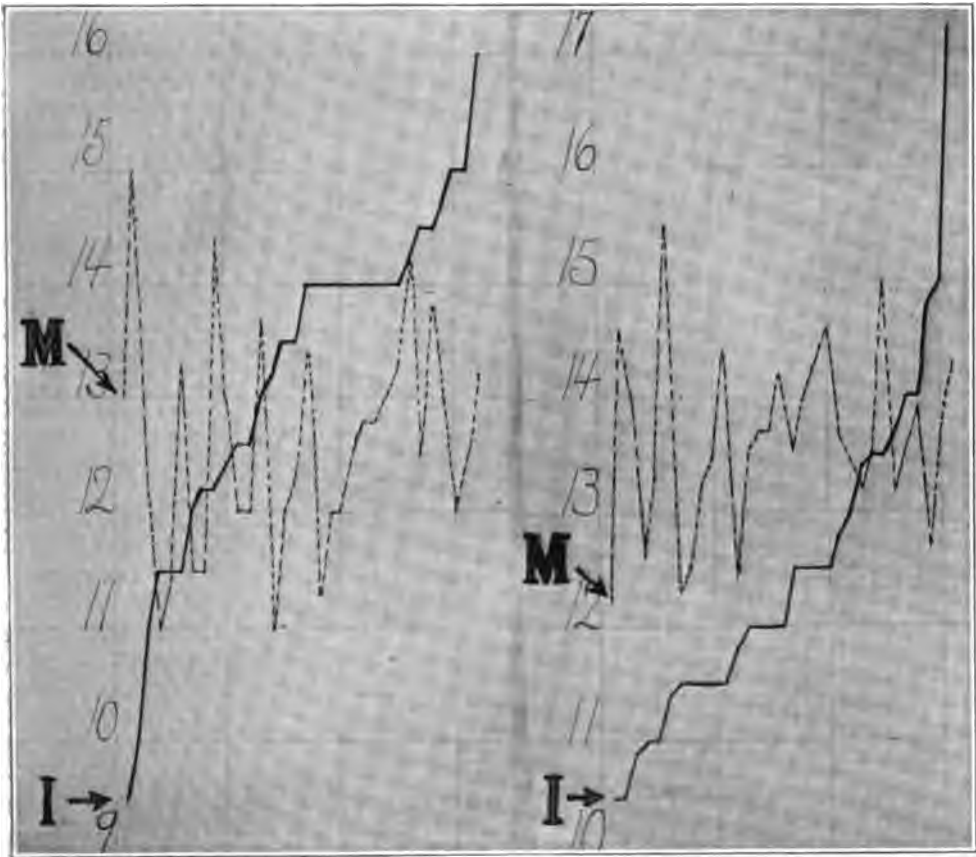


Fig. B.

Fig. C.

Fig. B.—Illustrating the relationship of the mesiodistal diameter of the upper central incisor and upper first molar of each individual orang possessing the same arch form. *I* indicates the incisor curve, and *M*, the molar curve; showing no correlation whatever between these dimensions. Numbers indicate dimensions of the teeth in millimeters.

Fig. C.—Illustrating the labio-lingual relationship of the upper central incisor and first molar, worked out in the same manner as in Fig. B.

found that there was no difference in the average for the central incisors belonging to one particular arch form, for the combined forms of all the arches showed a similar average. The same test was made upon all the anthropoids and the conclusion reached is that the average dimension of the incisors belonging to one arch form is no higher than the average of the central incisors belonging to the different arch forms. It was then of interest to find out whether there is a correlation between the two dimensions of one tooth in a

particular arch form; that is, is there a correlation between the mesio-distal diameter and the labio-lingual diameter of the same tooth in the same arch form? There was found to be none. Is there a correlation between the mesio-distal diameter of two teeth in the same form of arch? That is, is the mesio-distal diameter of the central incisor and the mesio-distal diameter of the first molar of the same dental arch in correlation?

Fig. B illustrates a diagram which will convey the answer.

Taking for instance, the pear-shaped arch of the orang, the mesio-distal diameter of the central incisor varies in that one arch form in different individuals between 9 and 16 millimeters. That is all right. It has a right to vary. But if there be a correlation between the dimensions of this tooth and those of any other tooth the dimensions of the other tooth should vary accordingly. So on arranging the dimensions of the incisors varying between 9 and 16 millimeters according to size, the ascending curve in Fig. B, *I* was obtained. But on charting the molars belonging to each individual whose incisors are thus marked, as indicated by the vertical lines, the irregular curve as may be seen in Fig. B, *M* was obtained. While there is a gradual rise in the mesio-distal dimension of the incisor, the sizes of the molars fluctuate up and down showing that there is absolutely no relation between the two. A similar arrangement of the labio-lingual dimensions of the same teeth, as may be seen in Fig. C, produced no different results. This test was made on every arch form of the various genera the result not changing at all. These records undoubtedly show the sort of correlation existing between dimensions of the teeth and of the form of the arch, thus having a concrete bearing upon a few of the points referred to by the essayist.

With relation to the charts of Dr. Johnson, he suggested that we should not pay any attention to them. To my mind they are very indicative, and I do not hesitate to say so.

I have been intensely interested in the study of the etiology of malocclusions for the last five or six years, and have made many studies and charted a good many cases to find something of value. I have published several papers on the subject, and the last contribution I made was based on the general disturbances of the individual in their relation to malocclusion. In the various studies I have found that there is a considerable correlation between malocclusion of the teeth and malnutrition of the individual in early infancy. Also subsequent disease processes, due not only to artificial feeding, but also to various conditions associated with disturbances that bring about artificial feeding are found to be correlated with occlusal anomalies. I would therefore be very much interested to know whether Dr. Johnson has made any examinations into the past history of the cases of malocclusion from which he has obtained these charts, because I feel that in some cases, like children who have suffered from exudative diathesis, there are certain defects which they probably never overcome. These defects would give expression in some sort of curve which may be indicative of some particular disturbance or disturbances in infancy.

*Dr. V. E. Barnes, Cleveland, Ohio.*—We should regard these arch forms as an expression of deformity rather than of normality. We may differ as to normal development. The development which we find in children of five or six years of age is in the majority of cases an expression of abnormal or deficient development, for the reason that in the Caucasian races we have a history of malnutrition, of insufficient nourishment due to artificial feeding. As I pointed out in a paper presented in 1912, we must not take those cases which come to us as normals. If a patient succumbs before maturity we may express that case generally as an abnormality. We must look at the case at first, not as normal, but as abnormal. Until it is a part of the normal we accept with considerable question the normal and abnormal. The types should be taken as expressions of deviations from the ideal. I do not know that we can calculate a perfectly normal arch. I do think, however, we can mathematically calculate an arch from the size of the tooth given us, and that is our limit, the zero measuring point from which we may later calculate deviations if they are constantly determined.

I have not had enough time to digest Dr. Johnson's paper, but I think he has tried to prove that the individual normal may be expressed in the malpositions of the teeth as we find them in that individual.

*Dr. W. H. Gilpatric, Boston, Mass.*—I did not intend to bring up the subject that I am about to refer to, but inasmuch as Dr. Hellman and Dr. Johnson led up to the predetermination of the dental arch to a certain extent, I shall refer to it.

Dr. Hellman spoke of apes. We as orthodontists are not today dealing with apes. He also spoke in regard to measuring one central incisor and predetermining the arch from it. I do not believe that can be done.

In the past two years and a half I have been working on the predetermination of the dental arch, and, as I understand and construe Dr. Johnson's paper, the individual normal arch. Nature has given us a certain tooth substance; we have not selected it for that individual case, and if patients come to us with these abnormalities, what are we going to do?

If you have 85 millimeters of tooth substance in the case of Johnny Jones, and 85 in the case of Billy Smith, does it not stand to reason that you are dealing absolutely with the same tooth substance in each arch? That you are going to have but slight variation from the contact point, and which you need to get in order to have the same shaped arch.

If you have 90 millimeters of arch tooth substance to deal with from the buccal groove of the first molar to its opposite, you can vary that arch but very little and still have normality. It is impossible. If you have 85 millimeters you naturally would have a different shaped arch from one where you had 90 millimeters.

What are the men doing with the cases that come to them? What basis have you for the predetermination of the arch? Nothing but the eye at the present time. Dr.

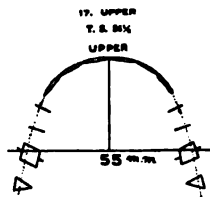


Fig. D.—Orthodontographic Normal Arch containing  $84\frac{1}{2}$  mm. of tooth substance, and arch width 55 mm. from buccal groove of first molar to its opposite.

Johnson is working on the right track, but there are a dozen different strings leading to the same point, and I am glad Dr. Johnson and several other men are making investigations along this line.

Supposing across the buccal groove from one side of the arch on the upper to the other you have 55 millimeters for a given tooth substance, if you have an ideal arch width to work to on a given tooth substance, and start in and prove that, it will help you. In my work I started out and worked very nearly a year, then I started to prove whether the work was correct. I began looking for the normal in the human mouth, and I have at the present time about fifty cases, and I can predetermine those arches for a given tooth substance. The greatest variation I have is one millimeter, and that is caused by the loss of the lower six year molar on one side.

I would like to make an appeal to the members here to get at these normal cases to check up my work and look for the normal for a given tooth substance to see what nature has done. My cases that I have treated and have established good relation between the tooth substance and the width of the molars, have been the easiest and most successful in retention. Here you see (indicating) the buccal groove measure, and I wish all the men, those who have been in practice for a long time, would go over their cases and tabulate those that have been most successful in retention, and see whether they shape or correspond with the work I have done up to the present time.

As I said before, I did not intend to speak on this subject, but I have been working along this line for a considerable time. It is an evolution of the work of Dr. Hawley,

Dr. Williams, and Dr. Stanton, and I have what I call the orthodontographic normal arch for a given tooth substance.

I have also developed a simple machine for surveying the malformed arch, and I wish to take this opportunity to present arches and the machine to you. I will give you the drawings, you can have them made, and if you wish to have that part of the arches copyrighted, so that you can have control of them, they are yours.

If my work is any help to you men, you are welcome to it. You can take it, pick it to pieces, or combine it with other ideas of other men. If there is anything in it that is good, save it and do not throw it away.

*Dr. Frederick C. Kemple, New York City.*—A few years ago in company with Dr. Clarence J. Grieves at the Baugh Institute of Anatomy in Philadelphia, I had the privilege of examining a rather large number of wet sections of the heads of children of ages varying from infancy to adult life. These specimens were made by Dr. Warren E. Davis for the purpose of studying the development of the accessory sinuses.

I was interested in finding out if there was any correlation between the development of the dental arch and the development of the nasal spaces and accessory sinuses. I was also interested in learning what change in the anatomic structure of the base of the skull might be induced by widening the upper dental arch that could possibly result in relieving pressure upon the pituitary body. The specimens examined, and there were quite a large number, apparently showed no definite relationship whatever between the development of the upper dental arch, the nasal spaces, and the accessory sinuses. Neither could either of us see how the widening of the upper dental arch could bring about a lowering of the body of the sphenoid bone, or in any other way relieve pressure upon the pituitary body. The anatomist in charge of the Institute ridiculed the idea of such a thing being possible.

Before examining these specimens and others in Dr. M. H. Cryer's collection. I had a preconceived notion that there was a definite relationship existing between these parts; that they developed more or less symmetrically; that well developed sinuses and nasal spaces accompanied well developed dental arches, and vice versa. But in my limited investigation I have found no evidence to support this theory. In fact just the opposite condition is found to exist so frequently that I am led to believe there may be no interdependence in the development of these parts. I am afraid that many of the idealistic theories in orthodontia will vanish into thin air under the searchlight of thorough scientific investigation, such as is being carried on by Dr. Johnson and Dr. Hellman.

It is a well-known fact in physiology that "hard structures must give way to the soft." In other words, slight pressure of any of the soft tissues upon any of the osseous tissues causes a giving way of the osseous tissue, either by resorption of the bone itself or by a change of its form. The records that Dr. Johnson is making of the nervous muscular action of the tongue are along this same line.

I am glad to have heard Dr. Johnson's paper, and to have seen the charts shown by Dr. Hellman. It is all very illuminating, and promises a brighter future for orthodontia. If a few more men will join in an effort to get at the truth, to uncover *facts* in orthodontia, it will not be many years until our specialty will rest on a scientific foundation, instead of being built upon the sand of a host of beautiful theories.

*Dr. Hellman.*—Dr. Johnson, you have shown one case in which the upper incisors were persistently drifting forward after retention. Did you observe whether that child or person was lisping?

*Dr. Johnson.*—No sir. We could not find any difficulty anywhere, and I would not have been led to this extreme if I had.

*Dr. B. W. Weinberger, New York City.*—I hesitate to discuss Dr. Johnson's paper because it would be unfair, for one can not do it justice without first thoroughly reading it. It proves one thing, however, that the general tendency of orthodontia in the last few years has changed and is progressing more towards the physiologic than the mechanical side. We must pay attention to the correlated facts between the various organs outside of the mouth and that brings us back to the point of the nervous system. This brings up

the question of calcium metabolism which has a direct bearing on tooth development and jaw growth. I do not know whether Dr. Johnson is familiar with the work of the neurologists. These men are paying a great deal of attention to the endocrine organs and their relation to the teeth and tooth substance, and to the construction and form of the teeth, and what direct bearing they have on the various nervous disturbances with which they have to deal. How much stress and how they are paying attention to the teeth and their form in trying to solve the various questions of thyroidism, pituitarism, and so on through the various cycles may be seen from recent literature. I think, as orthodontists, we have been very lax and in the future will have to pay more attention and open our eyes to the work that these men are doing. As orthodontists, we will have to recognize the knowledge that these men possess and the attention they have paid to the teeth and the bearing they have on calcium metabolism and on nervous disturbances with which they have to constantly deal. One of the main factors to be considered, and one of the first things they observed, is the blood pressure.

I want to ask Dr. Johnson whether he has taken into consideration blood pressure in charting these cases, because it is more than a nervous tendency for the tongue to raise the tip; and also indirectly to the endocrine organs which have a prenatal origin.

*Dr. Johnson (closing).*—I am very grateful to the men who have discussed my paper. It is very satisfying that Dr. Hellman should present the evidence he did at this time as he was wholly in ignorance as to what my paper was to be. We have evidently arrived at the same conclusions though following different lines of study.

Dr. Lischer misunderstood the reading of my paper. Variation I did not consider as exclusively of germinal origin. It may be of germinal origin or it may be of environmental origin. The form of an organ or part is the result of an interaction of forces. Two stones of different character exposed to the same environmental forces will take on different forms; and two stones of the same character exposed to different extraneous forces will show different conditions. The determining factor of form may be either heredity or environment. When we refer to the formative influence of function the word function is used in its broadest sense and not as referring to the specific activity of an organ or part. Function expresses all of the dynamic processes of the living organism; the complex of chemical reactions; the action, reaction and interaction of organs and parts in the adjustment of life.

*Dr. Lischer.*—Do you recognize modification?

*Dr. Johnson.*—Yes.

*Dr. Lischer.*—As distinct from variation?

*Dr. Johnson.*—The word variation covers the modification of form.

*A Member.*—What do you mean by modification?

*Dr. Lischer.*—Something that happens in the individual's lifetime.

*Dr. Johnson.*—The enlargement of a muscle as a result of exercise is modification, it is also variation. Variation may be qualitative as in mutations, illustrated in the work of Morgan on the *Drosophila*; or it may be quantitative as in the development of a muscle. I fail to see in what way my concept of the problem of orthodontia and the remarks of Dr. Gilpatric coincide. I have merely endeavored to formulate a concept which will serve as a scientific basis for the study of the individual organism. The slides have indicated one way to study the forces determining the form of the dental arch.

Dr. Weinberger asked about blood pressure and the internal secretions. I have not gone into these things far enough to answer the question intelligently. There are, of course, a great many correlations we can make.

# DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Under the Editorial Supervision of

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It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

## RADIOGRAMS IN RELATION TO ORTHODONTIC TREATMENT\*

BY T. G. DUCKWORTH, D.D.S., SAN ANTONIO, TEXAS

THERE are a number of conditions we must take under consideration when examining a mouth for the purpose of treating a case of malocclusion. It is not possible to determine the course of treatment of any orthodontic case unless we know or feel reasonably sure that certain conditions exist. It would be unfortunate to treat a case of malocclusion for several months under the impression that certain teeth would eventually erupt and take their position in the line of occlusion when in reality they were found to be impacted, transposed or missing entirely.

The application of the roentgen ray as a means of diagnosis of many conditions about the teeth and jaws is a method that has achieved a position of the utmost importance in recent years. Its value has long been recognized by the surgeon in the grosser lesions of bone, such as fractures, tumors, and dislocations. The surgeon is making use of the roentgen ray to a far greater extent than we can hope for, for the next few years at least. It is just as important and necessary that we make use of this valuable agent as it is applied to major surgery. Orthodontists are regarded as the guiding spirit in the eruption, development and position of the teeth and jaws. The application of the roentgen ray in determining the eruption of certain teeth is the only reliable source of information at our command. The extent of development and the position of unerupted teeth should be previous history in the treatment of malocclusion of orthodontia cases. It is not infrequent that the patients present themselves for orthodontic treatment with the first permanent molars decayed and the nerves exposed, oc-

\*Read before the Alumni Society of the Dewey School of Orthodontia, St. Louis, Mo., March 6-9, 1919.

asionally other teeth are found in the same stage of neglect, and when this occurs, and particularly in children at the age of ten or twelve, or still younger, the orthodontia problem becomes twofold, and the complication sometimes results in everything but the ideal. To meet these conditions in fairness to the child, is to determine to what extent these teeth can be saved, and to what use they may be employed in correcting the malocclusion.

It is common mistake among parents, even though they are inclined to manifest considerable interest in the care of their children's teeth, to permit the six year molars to decay, thinking them to be deciduous teeth and of little consequence, as they are to be replaced by ones more permanent. When these unfortunate conditions are found to exist an explanation of their immediate correction becomes apparent and a roentgenographic study of these teeth is necessary in most instances.

Infection of the investing tissue, loss of bone structure as the result of pyorrhea are factors to be overcome in advance, or during the course of treatment in a number of cases, even though in children quite young, is due solely to the irregularity.

It may be interesting to note a case which presented itself for orthodontic treatment in which the lower six year molars were decayed and the nerves exposed. The child was twelve years of age and with a very good set of teeth, except the molars mentioned and the irregularity, which was a Class I case. Roentgenograms of the decayed molars were made and the patient referred to his dentist. The exposures were made for the purpose of determining the condition of the apical portion of the teeth, which was considered at the time rather doubtful as to whether or not it was possible to properly fill the canals, due to the very large opening.

Attempts were made under this condition to save the teeth long enough to establish the arches, which required considerable expansion. The nerves of the teeth were removed, but the canals were not filled except with a treatment and cement constituted the filling material for the remaining portion. Regulating appliances were adjusted and the case was practically finished when the child developed a condition in the region of the submaxillary gland, which corresponded in size to a hen egg, and which continued to become larger, and apparently movable. The parents of the child, thinking it to be mumps, visited the eye, ear, nose and throat man. The physician, realizing it was not an infection of the parotid gland, pronounced it a true dental problem. The infected area became quite marked, and x-ray examinations were made to determine the source of infection, and it was at this time that the canals of the devitalized teeth were found to have only treatments, but apparently in a normal condition, devoid of any rarefied area in the apical region. Realizing the condition was acute and could not expect destruction in so short a time, there was no hesitancy in having the tooth extracted, and particularly as the child's temperature was increasing. On extracting the tooth there was no evidence of pus nor was there any evidence of relief. The following day the child was removed to the hospital and an incision made at the lower border of the mandible near the angle, pus in great quantity was found, which afforded relief to the patient almost immediately. The point which I wish to emphasize, in the case just described, is that we do not



know at what time we must rely to a very great extent upon x-ray findings to determine the solution of some of our orthodontia cases. It is true that the x-ray findings were negative in that they showed no rarefied area at the apical end of the tooth, but it did prove that the condition was acute, and the clinical findings and history was such as to disprove an other source of infection.

When we expose an area for the purpose of locating missing or impacted teeth, our information is just as essential whether we find the teeth present or whether we do not find them, and this is true of pathologic conditions in that we eliminate these areas if no destruction of tissue is found to be present.

From reports a number of orthodontists are going into the x-ray field to a considerable extent, and this must be in itself evidence of the importance of bridging the gap from an uncertainty to a positive fact. Information is gained from an orthodontic standpoint in several ways, of which we are familiar, but when we can add to our store of knowledge in this respect, and particularly when it makes the work easier and more positive in the prognosis, it is more likely to arouse enthusiasm to where one will put forth his best efforts in accomplishing the desired results.

There is a common mistake prevalent among men beginning the use of the roentgen ray, in that they start out with quite difficult exposures at first, and upon failing to get results, soon become discouraged and seldom make attempts to work out a more perfect technic.

There has been some discussion of compromise treatment in regulating cases that have attracted some attention, in that some views are not acceptable to other men who may treat the same case, or one similar. Cases require close scrutiny, and study of details, by means of models, facial casts, photographs and x-ray findings to determine the end results, and compromise treatments are generally the results of x-ray findings.

As a matter of record we are in a position to state with some degree of assurance that our work is going to be permanent, and will not be interfered with by such conditions as impacted supplementary teeth, odontomas and unerupted third molars.

It is not infrequent that we make exposures of apparently normal areas of the teeth and process in which we find abnormal conditions of which the patient is entirely unaware, and which would eventually give rise to some displacement of the teeth or produce a necrotic condition and possible loss of some of the teeth, ultimately breaking up or destroying the effects of our orthodontic treatment. The usual clinical steps in the mouth examination are to be regarded as preliminary or leading up to the roentgenographic examination. Without them as a guide we should be forced to pick out certain suspected areas for roentgenographic study, thus many times overlooking far more important conditions or, as is done by many roentgenologists, make films showing every tooth in the mouth, which is obviously a waste of time and material, and also frequently incomplete.

To overcome the defects of the usual method of examination, plates (5x7) are made of each side, taking in all the teeth of the upper and lower jaws from the cuspids backward, and also showing the region of the angle and ramus. This gives a survey of the mouth, discounting any preconceived ideas as to conditions

expected to be found. Unsuspected abnormalities are in this way frequently discovered, which would be overlooked if only certain areas, or even the usual location of teeth were covered with film; in addition to this pathologic conditions about lower bicuspid and molars are generally more satisfactorily shown in plates than in films.

In canal work the best detail is obtained by using the films, and particularly where dimensions are essential.

By following out a definite routine in mouth examinations we are frequently rewarded by the detection of unerupted teeth, especially third molars, which have their influence upon the developing arches in several ways, cysts, odontomas, roots in the maxillary sinus, diseased sinuses are not to be overlooked.

Roentgenograms, as ordinarily made, are flat pictures, they do not give any perspective, and it is impossible in such a picture to determine the relative position of given parts except in two dimensions. In the majority of dental conditions in which the roentgen ray is an aid in diagnosis, the single flat odontograms give all necessary information; but occasionally one meets with a case in which other methods are called into use with advantage. In the case of an unerupted canine, for instance, it is impossible to determine from a single film whether the unerupted tooth lies on the labial or the lingual aspect of the other teeth, and clinical signs of its position are often lacking. When this is the case we must resort to stereoscopic methods, or make the exposures in different positions and compare the odontograms.

In a recent issue of the *International Journal of Orthodontia* we note the history of an impacted second permanent molar which offers some complications in its possible removal. The illustrations suggest well the means employed to locate and be governed by in remedying these conditions. The article referred to is by Dr. James David McCoy in the February number. These conditions are unusual, but when they do exist, we frequently, as the author of this article states, err in judgment.

Another very interesting case was reported by Dr. Federspiel in the same number of the *Journal*; of which you have all no doubt had occasion to read. Occasionally broken or fractured mandibles are the results of accidents which occur while orthodontic appliances are being worn, and where there is any possible chance for the appliance being forced into the tissues, the part should be thoroughly x-rayed.

#### DISCUSSION

*Dr. Harry T. Deane, New York City.*—I would like to say a few words in reference to the use of x-ray in orthodontia. There are a lot of points brought out in the paper of Dr. Duckworth's which are very important. Towards the latter part of his paper he makes the statement that it is impossible to determine from a single film whether the unerupted tooth lies on the labial or lingual aspect of the other teeth, and that clinical signs of its position are often lacking. A way has been worked out by taking different pictures at different angles which, if compared, will tell the labial or lingual side of the roots. Mr. Hanau has been working on something of that sort. If a man will give the time and devote the necessary study to his work and take the proper number of films, if he does not get the right result the first time, and will keep it up, he will surely determine where the tooth lies.

There is another point about the x-ray, and it is this: Many practitioners take

radiograms and see everything under the sun except what really exists. There are many men who are anxious to diagnose radiograms for you. For instance, we have laboratories existing all over the country at the present time, and patients go to one and have a series of radiograms taken of the whole mouth. These men will write you a history of these patients describing conditions they never have had and could not have had if they wanted to, and as a result the patients are so misled that they will not take your word concerning what you say because they say the radiograms show such and such a condition. This shows that the x-ray laboratories at the present time are doing a great deal of harm, and particularly is this so in New York, and I have no doubt the same condition exists in other cities. There are certain men who charge a small fee for taking a radiogram; they take a set of pictures of the whole mouth, and do not care whether the picture comes out good or bad. However, they try to satisfy the patient that there is something wrong.

In the taking of a radiogram in orthodontia the point has been brought up with regard to the wisdom teeth. That point comes up often. I have in mind a case that baffled a good many people because the tooth would not stay in the proper position in the left side of the jaw with a heavy retainer. Several radiograms were taken and a wisdom tooth was found just at the end of the first permanent molar and tipping on that, crowding the six year molar and opening the bite.

More radiograms should be taken and properly interpreted. A man should understand how to read a radiogram, and if he does not know how to do it, he should get somebody else to do so, because many mistakes are made by not knowing how to interpret radiograms.

*The President.*—There are some points in this paper which are very interesting and should be thoroughly discussed.

*A Member.*—A radiogram should be made of the teeth if the patient is at the age where the temporary molars are present, for the simple reason that very often we find no permanent teeth to follow the temporary teeth; and again, we find a space. We expect to find a bicuspid erupting when often none is there. I know in my own practice I have been misled many times by guessing, until I found it was better to have a radiogram taken. I think a radiogram ought to be taken of every case. I think possibly the plate is better than the film, because it shows the whole side of the teeth in occlusion, and there is a great deal to be seen on a plate that can not be seen on a film.

Another thing in connection with patients with fillings is this: Very often in taking radiograms the radiograms will show an infected area around the ends of a root of a tooth which we wish to use as an anchor for an appliance, and I think these things should be taken care of before our work is begun in order to prevent further trouble.

*Dr. H. A. Pullen, Buffalo, New York.*—I heartily coincide with the views expressed that every dental practitioner should use the x-ray in cases where it is really necessary, but I do not think it is necessary to use it in every case.

I have had an x-ray machine in my office for many years and have found it of distinct advantage rather than to have to send my cases to an x-ray specialist. After a while one becomes accustomed to reading his own radiograms if he has had enough experience in doing it.

In the city of Buffalo we have a dental college where men send their cases for x-ray examination, and they charge the small fee of two dollars. They happen to have the finest x-ray machine there is, so that many dentists send their cases to them. Some men who have a very fine type of people to deal with in their practices do not care to send them to the dental infirmary where they mix up with the poorer classes of the city, and where they do not have very good accommodations for them. At the same time, they can get the finest pictures from the best machine by men who are experts at this work. If you can not get good pictures with a moderate priced machine, it would be better to send your cases to an expert and have him see what he finds in the radiogram. It is well to keep an x-ray index the same as you keep a photographic index of your cases to which you can refer.

*Dr. L. H. Wirt, South Bend, Indiana.*—I would like to bring out this one point:

orthodontia being a specialty of dentistry, the opinion prevails that we should limit ourselves to orthodontia. In my town (South Bend) there is a practitioner whose assistant is doing orthodontia and he himself is doing oral surgery, and both of them doing general dentistry. He told me he was very glad to take up orthodontia; that he did not want to specialize in everything because the public might think they were jacks of all trades.

The point is essentially this: if the public expect a man to specialize and stick to his own specialty, I have wondered whether the profession considers that the orthodontist should take his own x-ray pictures, or send them to a radiodontist. Many of us will concede that we can interpret our own pictures of our own cases more intelligently than we can interpret the pictures that somebody else takes, or better than somebody else can interpret the pictures we have taken. However, there should not be any hard feelings between the radiodontist and the orthodontist if he has his own machine and gets his own results. If a practitioner can not get better results by doing his own x-ray work, the radiograms should be taken by an expert radiodontist who can explain thoroughly what is needed in the way of exposures, and it seems to me in this way we would better serve our patients if we can not possibly take the radiograms ourselves. I would like to get the opinions of others on this phase of the subject.

*Dr. Martin Dewey, Chicago, Ill.*—One thing which Dr. Dean mentioned with regard to x-ray laboratories is more important than the profession realizes. There have crept into dentistry a number of commercial men who are doing radiography, and unfortunately some members of the dental profession refer their cases to them because they take pictures for a small fee, and they take pictures because the patients want them, and not because they wish to get definite results.

The other day an announcement was sent to our office printed in large type to this effect: "We will give you 5 per cent of all business you send to us." Such a thing as that is not likely to be favored by the medical or dental profession. These fellows get around the ethical side because they do not belong to the profession.

Dr. Pullen mentioned having radiograms taken at dental colleges where they have the best machines to do the work. It is much safer if patients can go to a dental college to have radiograms taken than to an x-ray laboratory. I wonder how many cases of syphilis have been transferred from one patient to another by x-ray laboratories! The average operator sticks his fingers into a patient's mouth and then passes on and introduces his fingers again into the mouth of another patient without taking the proper aseptic precautions, and there is great danger of infection being transferred from one patient to another in x-ray laboratories where operators are not particularly careful.

Very recently there was invited an expert commercial man to read a paper before a city dental society, and after the paper had been read the officers realized they had made a mistake and were severely criticized by some of the profession.

I think you are making a mistake by sending patients to an x-ray laboratory unless the laboratory man who runs it is absolutely on the same plane with you professionally.

The paper called attention to the fact that very often better results can be obtained by the extraoral method than by the film because with the extraoral method you have a survey of the whole side of the mouth with the teeth in occlusion, and you get a better relation of all conditions than by individual films. For root canal work the intraoral film is better because it gives a better relation of the root canal. For orthodontic purposes the extraoral plate is much better because the parts are in much better relation.

I am rather inclined to believe that it is a wise thing to make radiograms of all patients presenting themselves for orthodontic treatment. A radiogram should be a part of the case record just the same as our models and photographs, because we find sometimes cases of premolars or second molars where they are going to erupt or do not erupt. The patients may come to us for treatment during the time of eruption of the teeth. The second molar may push against the distal side of the first molar, and it is a good thing to know whether it occurred during treatment or before, so radiograms should be made and we should make a lot of them.

*Dr. Harry T. Deane, New York City.*—Great care should be taken by the radiographer in taking an x-ray picture. The machine may not be ready to take an exposure

and it may take several minutes to get the picture you want. You have your machine in the operating room and you get it tuned up. In the first place, you should have a screen for you to stand behind while doing this work. In the second place, in the operating room you should have the patient leave the room while you are trying out the machine. Do not subject the patient to any more ray than is necessary. Sometimes you may have occasion to take a number of pictures, and you have your tube box open between the exposures. Don't let the patient sit in the chair; let her go outside or put her behind the screen. There is great danger of burning if you do not know how to handle the machine. If it is properly handled, and you do what you should do, there is no danger.

I have used the x-ray machine for many years and used the first tube shown in New York. It is true, that many men in the earlier days who experimented a good deal with the x-ray lost their fingers and have had other injuries from its use, yet I have never had anything happen to me. I do not say this in a boasting spirit. I have taken every precaution to guard against such dangers. Dr. Satterlee, who is a big man in the use of the x-ray, is gradually losing his fingers from the use of the x-ray, and it is doing other damage to him physically. I believe these injuries are due largely to carelessness in the beginning of the use of the x-ray, and in not taking the proper precautions to protect one's self.

In these days there is no excuse for causing a burn on account of long exposures because the machines are made fool proof. You have a screen; you have a cover for the back and rubber pads put around the patient, and you have your films taken with a small or short exposure. You take the films; instead of paper being around them, they have a piece of lead on one side with rounded corners. That is the best film on the market. It does not irritate the patient and there is no shock. You can take a good x-ray of a single tooth, unless you are looking for deep trouble, with a short exposure. If the radiographer is careful, it is surprising what he can do with the x-ray machine. If you take x-rays, get your screen, get a glass cover and rubber pads, and be sure you have all these things before you start in.

*Dr. Max C. Ernst, St. Paul, Minnesota.*—With reference to the question of radiographic laboratories, if you want to call them that, I think we as dentists are to blame very largely not only for that situation but for the illegal practice of dentistry as a whole. I do not think there is any state in the Union that has not a fair law governing the practice of dentistry. We have one in the State Legislature of Minnesota for passage. I agree with Dr. Deane that there are men running these radiographic laboratories and making diagnoses for people who are not practicing dentistry. If such a man has no license, he is practicing dentistry illegally. We can get after such men in a legal way if we want to push the matter. This thing goes even farther than the x-ray part of it. There are lots of places around the country where they diagnose cases of orthodontia, and I am quite sure some of these places have dentists who are not licensed to diagnose such cases. This matter will bear looking into by the different states.

*Dr. S. W. Bradley, Ottawa, Canada.*—I might cite a couple of cases that have occurred in my practice. When I was in general dentistry practicing in a small country village I used to do some orthodontia, and in one particular case I moved a first bicuspid forward to make room for the second bicuspid, which I thought was impacted and I held the separation for a year and then decided to let it drift back. Since having an x-ray machine of my own, that patient came into my office and I made a radiogram and found the second bicuspid was not there at all.

Just the other day I had a patient aged eight years come in with two lower incisors erupted in beautiful alignment, and with very little spacing. On making an examination I found the other permanent incisor was not there at all. I made a radiogram of it and found the lower incisor very far down in the tissue. I do not see how the orthodontist can expect to get along satisfactorily without the use of the x-ray, but great care must be taken in the use of it.

*Dr. W. R. Dinham, Portland, Oregon.*—I make it a point to investigate the third molar region of the mouth very thoroughly. Last winter, while I was in San Francisco, I had the pleasure of hearing Dr. Moorehouse speak along the line of a paper published

in the *International Journal of Orthodontia*, and he stated that he got much of his information from previous papers written by Dr. Dewey and others. He had a splendid collection of slides illustrating the damage that can be done by the impacted wisdom tooth.

I also saw two practical cases in Portland that came to me after they had been under treatment by Dr. Moorehouse, showing the damage that had been done by the eruption of the impacted tooth forcing forward the lower teeth. This movement was accomplished in spite of retention and everything else, so I do not know whether the rest of you have been so unfortunate as I have along these lines. The third molar has caused more failures along orthodontic lines than anything else with which I am familiar.

*Dr. Weeks (closing the discussion for Dr. Duckworth).*—This discussion on Dr. Duckworth's paper has been excellent and interesting, and there were a lot of good points in the paper.

Dr. Deane spoke about Mr. Hanau going to bring up another one of these survey outfits. I hope he will leave them alone. I am not a mathematician, and I do not want to go into fractions in order to locate teeth. I can locate a tooth for Mr. Hanau in three exposures quicker than he can read two plus two, and I do not need to have his compasses and everything else. I do not care where a tooth is, I can localize that tooth within the sixteenth of an inch. There are ways of focusing the tube to do that.

Shall the orthodontist do his own x-ray work? There has been considerable discussion on that phase of the subject. I believe he should do his own x-ray work.

Dr. Dewey spoke of the danger in connection with the use of the x-ray, and Dr. Deane spoke about how to avoid that danger. I do not think there is any more danger connected with taking x-ray pictures than in being in this room if it is done right. You can have a lead room to work in and in that the x-ray room. I am down for another discussion and I have the slides and x-ray pictures to show why I believe that, but I will leave that phase of the subject at this time and bring it up later.

The doctor spoke of testing his tube. That can be done away with by putting in a good x-ray outfit and a Coolidge tube. I can put my rheostat where it should be; I know what the spark is; I know how many milliamperes I use, and the number of degrees, and when I throw my lever it has to go. I get pictures in three minutes, and have the patient back under my care. I do not believe there is any danger in that. I put the patient in the chair and use my x-ray machine. I have a lead room just big enough to get around in; I have a leaded window to look through.

Reference was made to the film. The film should have a lead back, and no matter how strong the ray penetrates to the lead, it reflects back on the other side of the tooth and gives a proper perspective to that tooth, and does it much better than a film that has no lead back on it.

The rest of the speakers have brought out other points in this excellent paper, and I simply wanted to call attention to the points mentioned.

## DISCUSSION OF PAPER BY DR. CLARENCE O. SIMPSON, "CO-OPERATION OF THE ORTHODONTIST AND THE RADIODONTIST"\*

*Dr. E. G. Weeks, Saginaw, Mich.*—I agree with Dr. Simpson all the way through so far as the practice of the x-ray or radiography as a specialty is concerned. Radiography often brings certain conditions more clearly to our attention.

He speaks of ill-fitting crowns as shown by the radiograph. We can not have men in the dental profession doing everything because they send too much to the laboratory for the high polish rather than for the fit. I believe the man who is making an artificial denture throughout, who is doing nothing but that, will do it better than the man who does everything. The men who are doing crown work will take time to make a jacket crown rather than an umbrella crown.

Speaking of the qualifications of the radiodontist, what he has said can not be too strongly recommended and endorsed, in that the radiographer should spend time to study not only his machine but his dental anatomy more thoroughly than is followed by the general practitioner of dentistry. He should take particular pains in selecting his equipment. There are small vest pocket kodaks on the market, and if you take radiograms and look at them, you will see there is a great fuzz all around the teeth. The radiogram does not give a clear outline of the parts you want to examine. If a man is doing radiography and is a professional man, I think he can do more for us than we can do for ourselves in our own offices. I would not give up my machine because I like to play with it. I have time to do it, and I think a complete x-ray of a mouth that is undergoing orthodontic treatment is as absolutely essential as the making of models. I can show you lots of models in my office, and I will defy any man to tell whether the teeth are present or not. Again, I can show you the most beautiful results before I got the machine in, and within a few months later have the patient come in and see a filling in the tooth going and find a bicuspid slipping on the lingual or buccal side. All these things could be eliminated if we knew what was there before we started. With complete localization of the teeth by the x-ray we could practice better orthodontia. I believe there has been too much guesswork.

*Dr. H. C. Pollock, St. Louis, Mo.*—I am not particularly familiar with the subject and am hardly prepared to discuss it, not having any x-ray experience. I know the essayist takes the position that a man should specialize in his work, and that the work under consideration should be done by a radiodontist to get the best possible results from every angle, and I think he is absolutely correct, although he is more or less of an idealist. Personally, I feel that in the practice of orthodontia we should have the work done in a scientific manner by a radiodontist. It works out that way, and we as orthodontists do not get one-fifth of the pictures we should have of our cases. I agree with Dr. Weeks that we ought to have pictures of all cases, and unless we have we do not know whether we have a missing tooth, an impacted tooth, or what we have. We should have radiographs between the period of the eruption of the permanent teeth and the temporary teeth, but this is hardly possible unless we have our own machine. Otherwise, I agree thoroughly with the essayist. There is no question of a doubt but that the men who are doing x-ray work, and are doing it exclusively, are doing much better work than anyone else we see doing it. They get that detail that the general practitioner does not get. That has been my observation.

*Dr. T. E. Purcell, Kansas City, Missouri.*—I can not let this occasion pass without mentioning the fact in connection with Dr. Simpson's paper, which I have enjoyed very much, that the Dental Board of Missouri has warned the supply houses not to fit teeth to models and that sort of thing.

The solution of the practice of radiodontia has got to come from the radiodontist.

\*Published in the JOURNAL, May, 1919, p. 226. Read before the Alumni Society of the Dewey School of Orthodontia, St. Louis, Mo., March 6-8, 1919.

The question of preventive dentistry is the most important thing that orthodontists and general practitioners of dentistry can consider today.

I have in my pocket some resolutions we are going to pass by the Missouri Dental Board, which will allow the very thing Dr. Simpson spoke of, namely, allow the assistant or dental nurse or dental hygienist to brush teeth. New York passed a law which allows the dental hygienists to clean the exposed surfaces of the teeth, but if there is a little collection of tartar below the gum which might result in pyorrhea, they must not go down there and remove it. The pyorrhea specialist would come in there.

The future of radiography comes from the orthodontist and radiodontist. We have a man in Kansas City who makes a specialty of radiography. He writes out a long diagnosis. He will say, for instance, that the upper right bicuspid has a diseased area at the end of the root, and if this can not be treated successfully I would advise extraction. Until the radiodontists can say definitely that this can be done and this can not be done, it is not a perfect profession. You can not expect the dental board composed of general practitioners of dentistry to say that this man or that man shall not take x-ray pictures. If the radiographers of the state would get together and outline some definite plan, we might be able to have some law on the subject. As it is now, we can not prevent any man from buying an x-ray machine and making radiographs and making wonderful diagnoses, so much so that you could not tell whether it was a tooth or a foot of which they had taken a picture.

We have idealists like Dr. Simpson, in the profession, who lift us out of a rut.

And we have not any more protection in radiography than we have in any other form of dentistry. I have a case now of a young girl with a second deciduous molar in place, and from the picture one would think that the bicuspid was up against the first molar crosswise in the jaw. But in six months the bicuspid appeared as nice as you please. The angle of the picture was wrong. I want the radiographer to take a picture and tell me definitely the condition of a certain tooth and its position, and not imagine this or that, then we will have a working agreement with the radiographer. Until we have that, and until radiographers work out a plan whereby we can regulate the practice of radiography, we shall have confusion and chaos.

*Dr. George F. Burke, Detroit, Michigan.*—We as a profession have been bothered to some extent by commercial dental radiographers, men who have neither received a medical nor dental degree, but not in late years so much as formerly.

It is my understanding that the Dental Board in Michigan interprets the taking of a dental x-ray film as a dental operation. At any rate, the attitude of the board in our state has put a quietus on the activities of the men who have taken neither a medical nor a dental degree. Certain it is, those men interested in dental radiography ought to interest themselves in this matter to a great extent, for the reason that men who are not familiar with the anatomy, pathology, and physiology of the human head ought not to attempt to read or interpret pictures for a client.

*Dr. Martin Dewey, Chicago, Ill.*—There is one thing that Dr. Simpson and Dr. Purcell spoke about concerning which I do not think they understand each other. As Dr. Purcell has stated, radiography is not a perfect science, but I think it depends upon the technic of the man taking the picture. If proper technic is used, the position of the tooth can be located quite accurately. Dr. Simpson referred particularly to the radiographic laboratories which are being conducted by the commercial men rather than by radiodontists who are dentists, and who have mastered the technic of taking pictures. We have in several states a number of x-ray laboratories conducted by men who are neither physicians nor dentists. These men make the argument that they are taking pictures, but we find all of them are willing to give a diagnosis if asked for, or some of them send in a diagnosis without being asked for it. Such laboratories as that should be regulated both by the medical and dental boards. It comes under one or both of these heads, because a man practicing dentistry or medicine, who takes a radiograph and diagnoses the case, is practicing medicine as much as the man who is called in consultation. The consulting physician gives his opinion regarding a certain case and by reason of that fact he is practicing medicine.



I do not know how the Missouri law reads, but it should be changed to put the commercial laboratories out of business. A man is a window trimmer one day and the next day a radiographer. Some of these men gain experience by being x-ray salesmen because they see a field in which they can make money, and they are not different from anybody else who enter fields without knowing anything about them. They know nothing about anatomy of the head or of the teeth. They are interested in making so many pictures each day and at such and such a price. Their work is very inferior, and they can not make a diagnosis because they know nothing about pathology. They have learned a few technical terms; they have learned medical terms that the medical men use, but they do not know what they mean. They have no knowledge of asepsis and of the spread of infection, and I think they are the worst parasites we have in the profession today. We can not blame everything on the state boards because the dental and medical professions have been responsible for the development of these parasites. The members of the dental profession have sent patients to these men because they take pictures cheaper. The dental and medical professions would kill these commercial laboratories themselves if they would use the right professional ethics. These commercial laboratories which Dr. Simpson condemns are being supported by certain members of the dental profession on account of the low price for which they take pictures, and one might as well send a patient to a plumber for a diagnosis as to send him to one of these laboratories. So there is creeping into the medical and dental professions these parasitic laboratories, if I might so call them, that are simply living off the dental profession because they appeal to the commercial side of the men who want to save a few dollars and are doing harm to the profession and a great deal more harm to the patients.

*Dr. T. E. Purcell.*—With reference to our Missouri Dental Law, there is no state that has a proper dental law for the simple reason that the members of our profession are doing what we have been spaking about. The profession is breaking up into specialties. Dr. Dewey, today, if he wanted to take the examination in the State of Nebraska under the state law, would have to fill teeth. If an orthodontist came to Missouri today, before the dental board would register him he would have to put in a certain number of fillings and make a set of teeth. That is the limit in that respect. Our dental boards have changed and have put on the statute books laws which do not solve the question.

I want to make an appeal to the radiographers to get together and see what kind of a law will protect us best in that regard and tell the dental board to put it on the statute books. We have a law now on our statute books which was copied by Michigan and Minnesota, and while it was not a model law, we thought it was when we put it on the statute books. We found out, after all, we had not a model law and will not have until the laws of the state recognize specialties, until radiodontia and orthodontia are recognized and various other things whereby a man coming from New York or from some other state to the State of Missouri can practice exodontia, orthodontia or radiodontia, and take examinations in these subjects only.

I would appeal again to the progressive men in x-ray work to get together and tell us the kind of law they want, then we can do something, otherwise we are working in the dark. I do not think it is wise to enact a dental law and have it put on the statute books before we really know what we want. In five years it might be an obstructive law instead of a constructive law, it might be the very thing we do not want to do. Let us go on for a while until we see where it brings us. If we find that dentistry is breaking up into specialties, then our dental laws will be more or less obsolete. We want the radiographers like Dr. Weeks and Dr. Simpson to tell us the kind of law that is needed for regulating the taking of radiographs. The mere fact that a man possesses a medical or dental degree does not mean that he can diagnose the case from a radiograph. That is not diagnosis by any means. We must have something definite along this line, a law that can be worked out from the experience of years as a constructive law, and not something that is holding us back.

*Dr. Simpson (closing).*—I appreciate this discussion. There were a number of points mentioned that could not be covered in the paper, but I am very grateful for one point which has been so thoroughly discussed, namely, that of regulating the future practice of

radiodontia. I believe the public and the profession will suffer from the further prostitution of radiography either dental or general. The points that were brought out by the different speakers were absolutely right.

Dr. Dewey presented an excellent argument when he said that this thing would not have become established had it not been supported by the profession. It is entirely within the power of the profession to control these things, but it is difficult to control the sentiments and ideals of the profession. We have a law in Missouri relating to the practice of dentistry which says that dental operations shall be performed only by those who are graduates in dentistry or have passed a satisfactory examination before the state board. There is no question that the practice of radiodontia, which means the manipulation of the teeth and soft tissues of the mouth, and the diagnosis of disease can be interpreted as the practice of dentistry. You can interpret the placing of a cotton dressing in an open cavity as the practice of dentistry. Much more important is the placing of a film which may be carelessly handled by unclean hands against the soft tissues, often producing a little irritation. There is an excellent opportunity for direct infection, and incidentally there is always danger present in the use of radiographic equipment. If it is not properly used, great harm can come from it,

Dr. Dewey spoke of salesmen doing radiographic work. I find more frequently it is the electricians who work into this. These men have not had the professional training or education for this work, and take radiographs for a small fee because they have not the training or knowledge to do the work as it ought to be done. They do not realize the import of it; they do not appreciate what the higher practice of radiodontia is; therefore, they render a very cheap, inefficient and easily produced service. Our law specifies some restriction about the practice of dentistry; it is merely a matter of interpretation whether or not the examination of the mouth, and making a diagnosis is the practice of dentistry. Also office assistants and women who have received little training along these lines are doing these operations. The same danger exists there as in minor dental operations. Furthermore, these partially trained assistants will produce radiographs which are misleading, which is another phase of the subject mentioned. By permitting the average office assistant to take radiographs in connection with these examinations, the operators may make incorrect diagnoses from them. I believe both of these things are well covered by the law. It is simply a matter of taking cognizance of the law and enforcing it.

One of the most radical enforcements of our dental law in Missouri is that in which dental supply houses have been instructed that their salesmen can not select artificial teeth and crowns for patients. You can send the model and shade guide, and they will select the teeth, but the salesman is not permitted to match the crowns for patients. A great many practitioners cut off the teeth and sent the patient to the supply house to save time and trouble, but the state board has instructed the supply houses to discontinue this practice. They have gone much farther in the interpretation of the law in that respect, than in permitting mechanics to make radiographic examinations of the mouth or permitting assistants who are not graduates in dentistry to make these examinations.

We hope within the next year to have an organization of radiodontists who can accomplish work along these and other lines in connection with the practice of dentistry. It is a comparatively undeveloped field and there is much to be done.

Dr. Pollock mentioned the point that it is difficult to secure a sufficient number of examinations for patients under orthodontic treatment. I think that is a matter of personal equation and methods. It is becoming easier to refer patients to the radiodontist. Patients are coming of their own accord and are suggesting it to the dentists. They are conceiving the idea that in order to have the work properly done a radiographic examination must be made, and I think we will all agree with that. They are suggesting this today, whereas ten years or even five years ago it would have been impractical to attempt to refer patients to radiodontists. At the present time and in the immediate future radiodontists will be consulted much more frequently than they have been in the past, and I see no reason why the radiodontist can not work in conjunction with the dentist if he is conveniently located. If you are located in a small city, where there is no man limiting his work to

dental radiography, it is a choice between doing the work yourself and sending it to a physician. On the other hand, where you are conveniently situated to a man who makes radiodontia a specialty, it is possible you will be able to secure better services by cooperating with him than in attempting to do the work yourself.

There are some technical phases connected with this subject which I expect to present next week in a paper entitled "Radiodontic Examinations for the Orthodontist." The present discussion is more a matter of professional relationship, and an attempt to present some ideals, some problems in the practice of radiodontia. I believe that it is only now being developed, and if you help the work along, within a few years you will find it will be of great assistance to you and that you have aided materially in developing a most important specialty in the practice of dentistry.

Dr. Purcell said the radiodontists made specific recommendations to the physician. and a few minutes later he said they did not know what they wanted and would not make any specific recommendations. In making these recommendations I think the average radiodontist is conservative and careful. He should never say that there is infection or an abscess, because he can not tell unless he makes a bacteriologic examination, and I do not believe an intelligent man engaged in this field of work would make that statement. But he can obtain information and evidence which will help the dentist in diagnosis. He can make recommendations contingent upon the clinical examination or bacteriologic examination. He is only supplying one certain service of what can be determined by the aid of the x-ray, which is the greatest diagnostic aid we have concerning the attachments and periapical structures of the teeth. He should limit himself only to that one specific thing of what modern practice has demonstrated can be shown by radiographic examination, and that is a great deal. When we have an efficient organization, we will be able to accomplish more along the lines of recommendation for legislation. Radiodontists should never overstep their field in making recommendations, and I do not believe Dr. Purcell would have any objections to the recommendations I make to the physician. I try never to be unfair to the dentists in this matter, but imply that this condition is the result of dental service, which was rendered at a time when the dental profession had not progressed to the present state of efficiency, and it was done without the aid of x-ray examination and things of that sort. Incidentally, the dentist should never resent the statement that there is periapical involvement of the tooth or there is evidence of infection from an apparently unfilled canal. I do not like to say that a canal is not filled, but apparently unfilled or partially filled. We seldom have to back down on a statement of that sort. The alert medical specialist has long since determined that his treatments are being handicapped by oral foci of infection. It has been proved and it has never been scientifically disproved, that there are secondary disturbances from these alveolar foci of infection. In the past we have been compelled to refer a patient to a general radiographer, a man of medical or laboratory training for an array of films showing a panoramic view of the teeth but deficient in information. If the physician or medical specialist was a conscientious conservative man he would not advise the extraction of teeth, or the retention of certain teeth. He would not feel competent to decide that question. If he consulted the family dentist the diagnosis might be further clouded. The family dentist might not be a man who was familiar with the far-reaching effects of the primary foci of infection. He might be prejudiced about operations in the mouth which he had performed. I think you will agree with that, and above all, he will surely be prejudiced by the problem of restoring lost teeth, so that his view is likely to be decidedly biased. The medical specialist welcomes the man with whom he can talk seriously and who will take the responsibility of making an honest, conservative recommendation in these cases. There is no reason why it should ever work a hardship or unfairness upon the dentist. I am willing to leave my recommendation to men who are qualified to judge these matters, or who have kept in touch with the progress of focal infections and their influences and effects.

If I have said anything to cause you to seriously consider the possibilities of developing the limited practice of radiodontia and secured your cooperation towards its development. I believe you will find it of distinct advantage to the future of dentistry and also to the future of orthodontia. I thank you.

# **DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA**

Under Editorial Supervision of

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## **A DISCUSSION OF THE FACTORS TO BE CONSIDERED IN DETERMINING WHETHER TO EXTRACT OR CONSERVE DISEASED TEETH\***

BY THOMAS B. HARTZELL, D.M.D., M.D., MINNEAPOLIS, MINN.

IN meeting the representatives of the professions of medicine and dentistry in different parts of the United States, I have been impressed with the fact that the dental profession has not given evidence of appreciation of the magnitude of its responsibilities. The rank and file of the profession still believe their responsibilities to begin and end with the repair and conservation of the teeth themselves. May I not, therefore, bring to your attention a few striking facts which tend to place these responsibilities in a light which forces a keener appreciation of them?

It is now conceded by the pathologists of the country that heart, joint, and kidney infections are largely of mouth origin. The isolation of the *Streptococcus viridans* from the heart's blood and from ulcerating surfaces of the hearts of individuals, who have died from endocarditis, has been conclusively proved by numerous observers. The observations of our pathologists clearly indicate that heart, joint, and kidney infections are closely related, and may be regarded as one disease. This being the case, figures available from the bureau of vital statistics of the United States government tend to place in its proper relation, our responsibility as a profession. Certainly, the heart disease of the nation is largely traceable to mouth infection, and I here wish to submit figures from the Bureau of Vital Statistics for the years 1915 and 1916 on the relative importance of heart disease as compared to tuberculosis.

In the year 1915, the Bureau of Vital Statistics collected evidence to show that 105,202 people died of heart disease, while only 98,000 and some odd hun-

\*Read before The Mid-Winter Clinic of Atlanta Society of Dental Surgeons, March 14, 1918, at Atlanta, Georgia. Reprinted by permission from American Journal of Surgery, May, 1919.

dreds died of tuberculosis in all its forms. These deaths occurred among 70 per cent of our population, because 30 per cent of our population failed to keep statistics of sufficient value to warrant their tabulation. In the year 1916, the contrast between heart disease and tuberculosis is even more marked, for in that year, the deaths from heart disease in the registration area numbered 114,171 or 159.4 persons per 100,000 of the population. The death rate from this cause shows a marked increase as compared with 1900 when it was only 123.1 per 100,000. The total number of deaths from heart disease in the whole country, estimating our population at 115,000,000, would be 182,850. Tuberculosis, in its various forms for the year 1916, destroyed 101,396 lives in the registration area. Because of the progress in the prevention and treatment of tuberculosis, the decline in our tuberculosis death rate has been quite pronounced, having fallen from 200.7 per 100,000 in 1907 to 141.6 in 1916—a decrease of almost thirty per cent. However, tuberculosis causes more deaths than any other malady, except heart disease, and 37 per cent more than all external causes, accidents, homicides, and suicides combined. Quoting again from the Bureau of Vital Statistics, the only remaining death rate higher than one hundred per 100,000 in 1916 was that of Bright's disease and acute nephritis. The total number of deaths from these maladies in 1916 was 75,316.<sup>1</sup>

It will be seen, therefore, that heart disease is a greater menace than tuberculosis and it is equally true that heart disease, to a very large extent, is preventable by proper mouth sanitation. The principal source of infection is the enormous growth of *Streptococcus viridans* in the oral cavity and on tooth surfaces, whence it enters the circulation through pyorrhea pockets, chronic dental abscesses, and tonsil crypts. These vital statistics just quoted take no account of the individuals whose lives are ruined by arthritis, nephritis of streptococcal origin, neuritis, gastric ulcer, chorea, septic purpura, iritis, and several less common forms of streptococciosis, which term has been recently advocated by Ulrich of Minneapolis to cover the various forms of inflammatory and pathologic lesions resulting from the invasion of the tissues by the streptococcus.

I desire to cite a case here of heart disease due to mouth infection. The above heart is that of Doctor X, who, when first seen, was suffering from a gastric ulcer. He was sound in every other particular, as far as our chief of the school of medicine, University of Minnesota, could determine, save for the presence of eight abscessed teeth. He was advised to have his abscessed teeth removed, and was sent to his home. Doctor X returned home, but did not have his abscessed tooth removed. In less than one month he returned for further examination, at which time he was found to be running a temperature and exhibiting heart weakness, having developed a loud murmur heard at the apex and transmitted to the axilla.

The patient was sent to bed in the hospital, December 18, and an ice pack was immediately placed over the heart. The routine treatment for endocarditis was given and the extraction of his abscessed teeth was advised. The first abscessed tooth removed was done with every precaution to prevent contamination of the abscess. The tissues around the area were bathed in iodine, the tooth

<sup>1</sup>Census Bureau's Summary of Mortality Statistics for 1915-16.

root surface was scrubbed with alcohol and iodine. Saliva was excluded with a generous pack of sterile gauze. The tissues at the tooth neck were cauterized and the root was then extracted. The abscess sack was split and cultured from, and grew *Streptococcus viridans* in numbers. This technic was repeated on two abscessed teeth with the same result. Then, two more abscessed teeth were removed but the patient was absolutely unbenefited by these extractions. Therefore, we ceased removing teeth. This patient ran a course in the hospital of some eighty-two days, developing a purpura of the skin of the arms and legs; also a progressive involvement of the joints, in the end dying from complete exhaustion. Postmortem revealed a large ulcer in the ventricle, most of the walls of which are cut away to better photograph the ulcer. The ulcer is almost an inch in diameter, and one-eighth of an inch high. It has the appearance of a spoonful of strawberry jam flattened out on the auricular wall. The valves immediately below the ulcer have sloughed off, leaving nothing but stumps of scar tissue upon which have developed large vegetations. The pillars of the *columna carnea* of the heart have also ulcerated. Culture from the ulcer at the time of postmortem developed prolific colonies of *Streptococcus viridans* on blood agar. A root tip amputation undertaken on the postmortem table under the strictest aseptic precautions also produced on culture, *Streptococcus viridans*. The postmortem further revealed small ulcers in the esophagus and also revealed a healed gastric ulcer.

Now in regard to the kidney, it must be remembered in thinking of Bright's disease that the medical profession does not always clearly differentiate kidney disease, and not infrequently, people die of acute kidney infection called Bright's disease. The term, Bright's disease, should only be applied to general glomerulo nephritis, which affects the glomeruli of the whole kidney. This brings me to the point I want to make, that streptococcal infection, whether the mild *Streptococcus viridans* or hemolytic streptococcus presents a complex of symptoms in many cases, which has clearly indicated to medicine that heart, joint, and kidney disease is in a great proportion of cases so closely associated that many physicians think of them as one. Whether this be a just conclusion or not, it tends to increase our responsibility in dealing with streptococcal infections of the mouth. I here submit a table from the Minnesota Division of the Mouth Infection Research Corps of the National Dental Association for the year ending July 1, 1916.<sup>2</sup> In this table, Hartzell and Henrici compare the destructive character of the hemolytic and nonhemolytic streptococci and show conclusively that the nonhemolytic streptococcus of the mouth can and does invade the tissues of these animals in about the same proportions, as does the hemolytic streptococcus. One should remember in studying this table that the nonhemolytic streptococcus makes its appearance about the sixth hour after life and is always present after such time, while the hemolytic streptococcus is an occasional visitor. Therefore, the importance of the nonhemolytic streptococcus to the life of a nation is infinitely greater from the standpoint of its destructive power than the hemolytic streptococcus. This tends to place our responsibility as dentists in a clearer light.

<sup>2</sup>Report of the Mouth-Infection Research Corps of the National Dental Association, for the year ending July 1, 1916. Reprinted from the Journal of the National Dental Association. Vol. III, No. 4. November, 1916, pp. 333-362.

The dental profession in years gone by has been chiefly engaged in conserving teeth without reference to or knowledge of the fact that in practicing this intensive conservation, they are oftentimes doing a serious damage to the patient, illustrated by the old aphorism, "Saving at the Spigot, but losing at the Bung." Medicine, on the other hand, has been quick to grasp every new thought or theory for controlling disease. This was clearly evidenced when the profession accepted the erroneous statements made by Bass and Johns and Barrett and Smith that ameba was the true cause of pyorrheal infection and that emetine was a sure cure for pyorrhea. It is not surprising, therefore, that there has sprung into being a great group of medical men and a few dentists, who, to control the death rate from mouth infection, vigorously assail the conservationist and ruthlessly sacrifice many valuable teeth.

In view of the fact that the writer has contributed a large amount of the evidence upon which these destructive mouth infections have been brought to the attention of the medical and dental world, it would seem no more than fair that he should also strive to place before the medical and dental profession a true perspective from which to observe the problem which necessarily confronts every man, practicing medicine and dentistry, as to what to do with diseased teeth and under what conditions we are justified in removing necessary dental masticating organs in order to prevent greater ills than those which arise from the lack of properly masticating our food. Therefore, let us consider for a moment the pathogenic flora of the mouth.

A close study of the mouth flora shows conclusively that while there are a great many bacteria found in the mouth at different times, there are really only four very important mouth organisms, and these I shall mention in the order of their importance.

There is first the *Streptococcus salivarius*, otherwise known as the *Streptococcus viridans*. Second, there is the pneumococcus. Third, the various members of the staphylococcal group—*albus*, *aureus*, and *citreus*. Fourth, is the fusiform bacillus. These organisms named are practically always to be found in the mouth. Of the group of four mentioned, we have found by actual investigation, by collecting the bacteria of the mouth in great quantities and administering these mixed masses of bacteria to animals, that the streptococcus is the only one which is regularly re-obtained in the lesions thus created. This same streptococcus, which bacteriologists formerly thought to be non-pathogenic, when transplanted into animals, is the germ which produces many varied forms of lesion, and according to our own observations and those of Gies and Kligler, composes approximately one-half the bulk of mouth growth.

The staphylococcus, roughly speaking, produces a little less than one-fifth of the mouth growth. The remaining 20 to 30 per cent of mouth growth in yeasts, thread forms, spirochete, and accidental visitants; also, the fusiform bacilli, and pneumococci.

In 1915, Madame Brailovsky-Lounkevitch, of the Pasteur Institute, published an exhaustive article recounting her experience in the examination of mouth flora from birth until adult life.<sup>3</sup> In this paper, she maintained and proved

<sup>3</sup>Contribution a l'etude d la Flore Microbienne Habituelle de la Couche Normale (Annales de l'Institut Pasteur, August, 1915, xxix, p. 379).

that the first organism to make its appearance in the mouth of a babe is the streptococcus salivarius, which occurs about the sixth hour, and from that time on until the eruption of teeth, is practically the only organism of the mouth except occasional transient accidental visitants.

We have found upon examination and study of the flora of the mouths of individuals, that from the period of eruption of teeth until adult life, this same streptococcus makes practically 50 per cent of the mouth growth. We now know that the presence of the streptococcus is almost universal. It occurs in houses, in dust, on the skin, in milk, and in many foods. There have been at least three streptococcal epidemics produced through the medium of milk, which have been reported in the medical journals. Probably, the most striking one was that in Boston, which was described by Theobald and Smith in the *Journal of Medical Research*,<sup>4</sup> and has been alluded to by many other writers.

The individuals who advocate complete destruction of dental organs in order to rid the body of streptococcal growth, therefore evidence profound ignorance. Wholesale extraction of teeth will not rid the body of streptococcal growth. One might as well advise removal of the transverse colon to rid the body of the colon bacillus. A much more sane method of cutting down the inroads of mouth infection is that of vigorous systematic mouth sanitation together with the adoption of a diet planned to prevent intestinal putrefaction. This is just as capable of reducing the enormous mouth growth to a safe minimum as are the present methods for controlling bacterial growth in milk, now demanded by our cities. The difference by weight and count in the number of bacteria per milligram of tooth scrapings in dirty mouths to that of reasonably clean mouths has been shown by Kligler and Gies<sup>5</sup> to range from eight hundred million in the dirty mouth to five to eight million in the clean mouth. Translated into terms of oral prophylaxis, we may find that ten minutes a day spent in proper mouth sanitation will produce this safe minimum. The writer's first thought then in regard to the extraction question is that correct mouth sanitation and proper diet will make ruthless extraction of teeth unnecessary. A proper education of the dental profession in a broad way will soon enable them to place in a true perspective the factors which actually justify conservation, or, on the other hand, extraction.

Please recall that the mouth streptococcus makes its appearance at birth, and that it forms (roughly speaking) half the mouth growth; also, that our bodies are of greater or less degree, sensitized to its presence and that its most destructive attribute is the production of secondary anemia. Its toxins lessen vitality and lay a foundation of physical weakness in an individual for its ravages in the tissues when it becomes too numerous for the leucocytes in the blood stream to destroy the individual members of the family, which gain access to the stream. Therefore, the first broad view that should come into the mind of an individual as to the conservation or destruction of infected teeth should rest on the wealth or poverty of the blood stream. To illustrate, an individual with a full complement of red cells, five million to the cubic centimeter of blood with a hemoglobin of not less than eighty-five, and a leucocyte count of seven to

<sup>4</sup>Medical Research, 1915, xxxi, page 455.

<sup>5</sup>Journal of Allied Societies, September, 1915, x, No. 3, pp. 282-331.



eight thousand to the cubic centimeter together with a normal digestion, a normal urine, and a reasonable amount of energy, is safe in conserving any of his dental organs which might present for treatment. This conservation should be first, the reduction of mouth growth by prophylactic means to as nearly as possible the minimum, and, where teeth must be devitalized, such devitalization should be done under exactly the same kind of surgical asepsis, as is demanded of surgery of the brain or abdominal cavity.

Now, as to the other side of this question, as to when we are justified in breaking down dental mechanisms by extraction. This must rest again upon an examination of the patient's vital resistance, expressed by the blood stream, together with any evidence which tends to prove that the individual has been oversensitized or brought into a condition of anaphylaxis to streptococcal infection by a long exposure to such infection. A clinical picture, which would demand extraction, might be as follows: Early history of tooth and tonsil infection, swollen glands, draining the mouth and throat area, poverty of red cells, reduced hemoglobin, and a markedly increased or decreased leucocyte count. It is a well recognized fact that a leucocyte count above ten thousand is strongly indicative of deep seated infection, while a low leucocyte count, say five thousand or less, points to the fact that the leucocytes are waging a losing battle, particularly if such reduction in number is accompanied by reduced hemoglobin. If a clinical picture presents with the evidence of secondary infection, myocarditis, endocarditis, or nephritis accompanied by joint or kidney disease (evidenced by casts, albumin, or sugar) extraction is justifiable. Any of the factors above recited accompanied by the poverty of red cells and poverty of hemoglobin, even if the leucocyte count be normal, fully justify the extraction of diseased teeth. One might go on and enumerate combinations of clinical pictures which would bring in many other physical conditions dependent upon streptococciosis. For instance, in chronic streptococcal infection, one infrequently finds cholecystitis, and on palpation, an enlarged spleen. While the dentist, who has not had the advantage of a medical training, may not be capable of gathering all the evidence tending to establish a condition demanding the positive eradication of all primary sources of infection which can be reached, he can always or almost always bring into his counsel, an internist or the family physician to aid him in gathering the necessary data on which to base a sane conclusion. The time is fast approaching, if not already here, when the men in the practice of medicine and dentistry are willing to listen to the arguments, pro and con, which should determine a wise course of treatment. Individuals, who present a clinical picture which tends to establish the fact that the body has waged an unsuccessful war against streptococcal infection for a series of years, perhaps from youth up, and who are now suffering from any one of the evident phases of streptococcal infection, had better exist without teeth than go on with a primary intake from even one abscessed tooth. It is my observation that many times a sensitization of years' standing with a single, small continuous source of infection is sufficient to maintain such a marked secondary condition as to utterly unfit the individual for the duties of life. Let me mention a case illustrating this point.

A man forty-eight years of age, six feet, one inch tall, weight two hundred pounds, with a normal blood and urine, having led a very active and vigorous

life and possessing a very strong denture, was, during the latter part of 1916, stricken with septic purpura of the upper and lower extremities. This purpura came on following any muscular effort and was exaggerated by walking or carrying even the moderate weight of a light traveling bag. The hemorrhages would disappear on rest in bed, only to reappear when muscular effort was indulged in. The patient sought relief in different parts of the country and was advised that his tonsils were possibly the source of his infection. Consequently, his tonsils were removed in 1916 with some temporary benefit resulting thereafter, but after a period of rest, and the patient later again attempting to work, the hemorrhages recurred in greater numbers. When this man was first seen by the writer, there had recently occurred a large crop of new hemorrhages on his arms and legs. Patient was advised to go to bed and rest for a few days. Accompanying the purpura, was a broken compensation, which heart lesion doubtless originated from the some source of infection which caused the hemorrhages under the skin. The patient was subjected to a very searching physical examination by the chief of medicine, University of Minnesota. No source of infection could be demonstrated. Finally, this patient was referred to the writer for an examination of his mouth, and it was found that the individual had two devitalized teeth with very slight granulomata about their root ends. The gums adjoining the teeth were rather a purple or lavender color and very much thickened. No pus could be squeezed from the gums, although an instrument could be thrust into the gum crevice of the molar region both above and below from one-eighth to one-fourth of an inch. There were exhibited a few deposits on these roots. The removal of the deposits caused profuse hemorrhages from the gum, but no pus was seen to issue from these gums at any time. Slow treatment of the teeth was practiced, operating upon one tooth at time and allowing a period of three to five days to elapse before another was touched. Upon complete cleansing of all the root surfaces, the hemorrhages had quite disappeared and have never recurred in any great amount since. The patient occasionally, under heavy stress, will have a very few small punctate hemorrhages on the lower extremities above the ankles. Since the mouth treatment was given him, the patient has been engaged in his usual vocation for the past four months, although he has been incapacitated for the previous two years. The follow-up treatment in this case has been vigorous massage, which emptied the congested and infected blood from the tissues adjacent to the teeth into the general blood stream, so that the bacteria hitherto lodged in these tissues were readily phagocyted. This after-treatment was most important. The patient has also practiced intensive mouth and tooth sanitation, rubbing the teeth until they shine and removing from them most of the daily growth of bacteria. In this connection, it must be remembered that the streptococcal growth, when absolutely unrestrained by physical conditions, doubles every thirty minutes. Therefore, the great importance of vigorous scrubbing of mouth and tooth surfaces with the plentiful use of water to flush out the organisms, and the use of disclosing stain to guide the patient in his effort to get his teeth clean, and to restrain the growth and lessen the number of bacteria from day to day, is here emphasized.

I have mentioned this particular case because septic purpura is comparatively rare, and had it not been for the method adopted in eradicating this in-

fection the patient would never have completely recovered, as with a broken compensation dependent on myocarditis and a previous old endocarditis, had complete extraction been performed at one sitting, the result might have been the wrecking of the patient's whole chance of life. A normal blood and urine justified conservation.

Let me relate another case history, in which extraction was wrongly advised—that of a young woman thirty-two years old with an arthritis of the ankles and insteps of sufficient severity to make walking extremely painful, with absolutely no source of infection hitherto discovered to explain the arthritis. Examination of the mouth showed that every tooth in the upper and lower arch was vital. No large cavities existed and no lesion of the mouth, save a very vigorous gingivitis, involving less than one-eighth of an inch of the gum margin. Upon the application of disclosing stain, masses of bacterial plaques were revealed, covering all save the grinding surfaces of the teeth. This patient was so extremely sensitive that even in doing an ordinary prophylaxis, it was necessary to administer an anesthetic. Five different treatments, five days apart, using fine stones to grind out the pits dissolved into the enamel surface by the heavy masses of acid-forming cocci, and the reduction of mouth growth resulted in complete reduction of the swelling of the ankle and instep, and the continued practice of mouth prophylaxis of fifteen minutes a day, massaging the gums with the ends of half inch cotton rolls and scrubbing the teeth with brush and paste, applying disclosing stain twice a week, resulted in a complete cure of the gingivitis and the arthritis of the feet, which cure is still perfect. It must be remembered that no dead pulps existed and no teeth were extracted and the blood picture was good.

Take a third case, a young woman thirty-five years of age; two children, one eight years old, and the second child lost from puerperal uremia, accompanied with a blood pressure of 250. No cause known for the uremia. Patient was advised that the condition arose as a result of mouth infection and was referred to the writer for the complete removal of all her teeth. A careful examination of the teeth in the arches showed pyorrhea pockets around the molars, none of which were more than one-eighth of an inch in depth, and two pulpless teeth, left and right laterals in the upper arch. The roots of these teeth were rather imperfectly filled and presented small granulomata. The treatment given this patient was slow inoculation by pyorrhea treatment given seven or eight days apart, and was completed by the amputation of the two diseased root tips in question. The patient at the beginning of treatment presented casts and albumin in her urine, and presented blood pressure of 250. At the close of her mouth treatment, the blood pressure had dropped to 190 and only an occasional trace of albumin can now be found in her urine.

These three cases serve to illustrate what may be done by intelligent conservation accompanied by proper daily mouth sanitation. In these three cases, the hemoglobin and red cell count were practically normal, and the leucocyte count showed a rise of two to three thousand. Had these cases presented very marked anemias or past histories of long drawn-out chronic infections it probably would have been impossible to have benefited them, but the leucocyte count and the

hemoglobin indicated to the writer a strong possibility for cure. Though in two instances, complete removal of the teeth was advocated, no teeth were removed, while in the case of septic purpura, the third molars were removed because the pockets around the third molars were more than one-fourth of an inch in depth, and the balance of the denture was in such perfect condition that the patient could well afford the loss of his third molars.

Allow me to present a case illustrating the line to be followed where secondary anemia has existed for some time.

Mrs. D., seventy years of age, presented a set of sound teeth, which formerly had been affected with pyorrhea. Pockets around teeth but not discharging pus. When she first appeared April 17, her red cell count was 3,000,000 and her hemoglobin was 70. Patient desired the removal of all her teeth as she had spent the winter in the South and lived under the most encouraging conditions to improve her health and increase the hemoglobin and red cell count. No improvement of anemia occurred. Slow extraction of her devitalized teeth was undertaken, as well as those affected with pyorrhea—one tooth every week or ten days. Since this has been accomplished, her red cell count has increased to 4,100,000. In this case, pyorrhea treatment had been administered three years before, and as far as the mouth tissues were concerned, the treatment was apparently successful. Nevertheless, there must have been a sufficient amount of growth around the dead teeth and in the seemingly healed pyorrhea pockets to reduce the patient's hemoglobin and blood count. Though no masticating surfaces have been placed in this mouth following the extractions, the patient being limited to the incisors and cuspids above and below, the red cell count has increased.

In this case without a blood picture, conservation would surely have demanded retention of the teeth. The blood picture, however, fully justified extraction, and though it was necessary to break down a good masticating mechanism, the patient was greatly benefited as far as her general health was concerned. In this connection, too much stress can not be put upon the pioneer work done on the subject of hemanalysis and urinalysis by Colonel Wm. H. G. Logan. The result of his experimental work is recorded in the *Dental Review*, September, 1916.

Another case, a man about sixty years of age presented teeth which were apparently solid in his arches, but with a series of pyorrhea pockets involving most of the teeth. This case seemed to be clearly within the scope of successful treatment. Therefore, one pyorrhea treatment was given, which markedly reduced the energy of the patient. The patient returned in one week for an additional pyorrhea treatment. Immediate examination of the urine was suggested. The urine was carefully examined. The specific gravity was high and it contained between 4 and 5 per cent of sugar. Conservative treatment of these teeth was immediately discontinued, and extractions were undertaken at intervals of seven or eight days apart. In this instance, the patient was saved the burden of pyorrhea treatment. Under ordinary conditions with a healthy kidney and normal blood picture, these teeth would have been treated.

Therefore, we need to emphasize the fact that modern means of laboratory

diagnosis and the taking of careful case histories with the modern x-ray pictures, should be the foundation stones upon which conservative or destructive dentistry should be determined.

If the dental and medical professions will get together on all cases in which extraction is advocated, and will gather and weigh the evidence each case presents, it seems altogether likely to me that we can arrive at such a sane and reasonable judgment of the conditions that justice will be done to all.

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## A CASE OF IRITIS DUE TO THIRD MOLAR IMPACTION\*

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BY T. I. LEICHE, D.D.S., CHICAGO, ILL.

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THE case history of Mr. C. P., Age 42. In Aug., 1917, the patient had a severe attack of iritis and neuralgia of the left side of the face, head, neck and shoulder.

Oculist's treatment: Sodium salicylate, atropine in eye—2 injections of strepto-staphylococcus vaccine. The attack lasted three weeks. He then suffered a nervous breakdown, and was sent to the country for two months to recuperate. He recovered slowly.

In Feb., 1918, a second attack occurred which commenced after he had been exposed to cold. The attack lasted a week. Treatment as in first attack, but instead of vaccine he was given intravenous injection of some other remedy.

He had no history of lues. Two Wassermann tests were made, both negative.

At this time he was referred to the writer. Skiagrams were taken of both dental arches. This revealed an impacted third molar in the upper left arch.

He was advised to have it removed, but refused such treatment. In Sept., 1918, he again suffered an attack. After having been in bed about a week he presented himself to have the impacted tooth removed.

It was decided to remove both the second and third molars under infiltration anesthesia.

Within 12 hours afterwards the iritis subsided and in a week the neuralgia had disappeared.

To date there has been no recurrence of the disorder.

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\*American Journal of Surgery, vol. xxxiii. No. 5, May 1919.

# **ABSTRACT OF CURRENT LITERATURE**

**Covering Such Subjects as**

**ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY**

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

## **ORTHODONTIA**

**Orthodontic Technic. Facial Impressions and Casts. Ch. A. Spahn. The New Jersey Dental Journal, 1919, p. 135.**

Orthodontic procedures and surgical operations for the correction of dento-facial deformities are greatly facilitated by the employment of facial plaster casts, made from plaster impressions which exactly represent the natural contours. The superiority of these casts, as compared to facial photographs, is emphasized by the author who points out that they permit an examination of every outline from different angles of observation. The patient's confidence and intelligent cooperation having been secured, he should be placed in an easy slanting position; every part of the face where the plaster is to be laid is then rapidly brushed over with partially liquefied white vaseline, using preferably a small shaving brush, and commencing with the cheek. Next, the vaseline is applied to the mouth, lips, and teeth, if the latter are exposed. The patient is instructed to look upward for a few moments while the vaseline is carried up under the eye, in order to protect the lashes of the upper lid. The eyes being closed, the surface of the upper lid is lubricated down to the lashes, then the depression surrounding the canthus down over the nose to the borders of the nostrils. The vaseline should stop just beyond the border of the median line of the face, for a cast of the profile only. If a front view impression is intended to be taken in one piece, its distal borders should not extend beyond the molar prominences, as otherwise it will be difficult to remove without breaking.

The plaster should be of a fine but slowly setting quality, mixed with a slight excess of water and stirred to a smooth clinging consistency, easily handled with a spatula and adhering to inclined surfaces. It is laid with a spatula of the ordinary width, but about two-thirds the usual length, first upon the cheek, passing toward the mouth, extending it beyond the median line, and from the wings and septum of the nose to a point well beneath the chin. With the patient looking steadily toward the ceiling, the cheek is then covered to the border of the lower lid. The plaster must be spread smoothly over the surface and

down into deep impressions, as between lips, around exposed teeth, etc. To begin with, the plaster should be no thicker than is required for the impression; it can be reinforced finally at the weaker points for strength. The manipulation of the plaster must be skillfully conducted, guarding against all abrupt or awkward motions which may hurt or startle the patient.

### **New Pincers for the Adjustment of Angle's Ribbon Arch and Bracket.**

L. A. Carrea. *La Odontologia Argentina*, 1918, x, No. 12, p. 397.

In adjusting the elastic ribbon arch in the brackets of the modern Angle apparatus the chief difficulty consists in overcoming the resistance of the ribbon arch and in fixing it gently and securely in the bracket, under avoidance of detachment of the band which holds the bracket, from the tooth to which it is fixed. In the *Dental Cosmos* of November, 1917, R. W. Gaston contributed a description of a set of original devices, consisting of a male and a female instrument, which act by simple leverage, but are not absolutely reliable and do not entirely protect against the danger of false passages or displacement of parts of the apparatus. A cheap and simple appliance devised by Carrea guards against these inconveniences, permitting accurate support, regulating the force, and reliably attaching the ribbon arch to the bracket. The safety-pin of Angle may be employed at the same time. The explanation in the text of the author's new pincers or nippers for the adjustment of Angle's ribbon arch and bracket is based on a number of illustrations without which all attempts at description would be futile.

### **The Teeth and Tonsils as Causative Factors in Arthritis. R. Hammond.**

*The American Journal of the Medical Sciences*, 1918, clvi, p. 541.

Summary: The relation of the teeth and tonsils to arthritis is at present a moot question. Billings and his followers point to the careful work of Rose now and others on the bacteriology of arthritis and to the numerous cases of improvement and cure of arthritis following removal of diseased teeth and tonsils. They believe that this proves the accuracy of their contention that a focus of infection exists in the head in many of these cases. On the other hand, many trained pathologists and reputable clinicians have been unable to reproduce either the laboratory findings or the clinical results of the Chicago workers. Consequently they either reject the theory as a whole or accept it in a greatly modified form. It is probable that the pendulum has swung too far in the direction of the wholesale removal of teeth and tonsils. The truth will probably be found in a middle ground somewhere between these divergent theories. There is undoubted improvement in numerous cases of arthritis following the removal of an abscessed tooth or a diseased tonsil or when a case of pyorrhea has received proper treatment. On the contrary, many such cases are given similar careful treatment without affecting the progress of the joint condition in the slightest degree. One reason for the failure to obtain successful results in arthritis by treatment of dental and tonsillar disease is that the cases have been selected without knowledge of the exact pathologic condition present in the or-

gan in question. Many apical abscesses in which nature had effected a cure by walling off the disease have been treated by extraction of teeth. This has resulted not only in the loss of valuable teeth, but has at times been the cause of a dissemination of the infection to other parts of the body, with dire results. Careful and specific training is essential to the recognition of a tooth or tonsil as an active agent of infection, and such knowledge must be supplemented by accurate interpretation of dental roentgenograms and skilful laboratory work. The x-rays are of the greatest value in accurately diagnosing certain diseased conditions of the teeth which are considered to have an etiologic relation to arthritis. The greatest field of usefulness probably is in locating abscesses around the apices of nonvital teeth. The interpretation of dental roentgenograms is full of pitfalls; at certain angles the shadows of the nasal cavity or antrum may overlie the tooth and simulate the appearance of an abscess. An abscess may exist which can not be revealed by the roentgen rays. Again, a crudely interpreted x-ray picture may lead to the sacrifice of unoffending teeth. Arthritic cases by no means always clear up after mouth infection has been removed. In acute arthritis the probability of producing a cure or improvement by the removal of a supposed focus in the teeth or tonsils is greater than in cases in the chronic stage. It is unreasonable to suppose that a restoration of function can be brought about in joints where extensive pathologic changes have taken place. But even when no change is apparent in the joint condition, proper treatment of diseased conditions of the teeth and tonsils is usually followed by marked improvement in the general health of the patients.

**Chronic Marginal Gingivitis: Its Commonest Causes.** F. M. Holborn, *British Dental Journal*, 1919, xl, No. 9, p. 329.

In this article, which is destined primarily for students and for those who have not had the opportunity of observing the same patients' mouths over a period of many years, the author calls attention to some very common causes of marginal gingivitis which are apt to be overlooked, such as slightly receding, hypertrophied, or readily bleeding gum margins, or hard, dark calculi, more or less inaccessibly situated beneath the gum. The fact is emphasized that for the maintenance of the gums in a healthy condition, and for the prevention of the formation of so-called serumal calculus, by far the most helpful procedure is regular massage. Applied by the patient himself, with greased thumb or forefinger, in a direction from the gums to the teeth, so as to express therefrom remnants of food and so forth. The thick, soft yellow tartar formed by the action of salts in the saliva mixed with food is fairly easy to remove. The origin of hard, dark calculus beneath the gum and between the teeth is obscure, and the author is inclined to interpret it as a product thrown out by inflamed gum margins, since it is always present in that condition. It is also a continuing cause of further gingivitis, and therefore part of a vicious circle. The insertion of fillings with badly finished cervical margins is followed sooner or later by absorption of gum and periodontal membrane, and formation of hard calculus. Dentures and orthodontic appliances often cause considerable gingivitis and



chronic periodontitis, whereas, local marginal gingivitis is usually caused by loss of function, loss of and faulty contact point, malocclusion, crown and denture bands, bridge-work, fillings with projecting cervical margins.

## ORAL SURGERY

**Tumors from a Dental Standpoint.** M. Wassman. *The Pacific Dental Gazette*, 1919, xxvii, No. 3, p. 127.

The author emphasizes the advisability of keeping tumors, both innocent and malignant, constantly in mind in the practice of dentistry. Any abnormal conditions in the oral cavity should immediately arouse the interest of the dentist. By far the best means of diagnosis of a tumor or a suspected tumor is a histologic diagnosis. After it has been ascertained whether the growth is benign or malignant, a differentiation must be made between sarcoma and carcinoma. The prognosis in most cases in cancer of the lips, floor of the mouth, tongue and jaws is at best very grave. The only reliable method of treatment is to effect the removal or destruction of malignant growths.

Of special interest to the dental surgeon are odontomas, or benign tumors which arise from tooth germ, in part or as a whole. Epithelial odontomas, derived from the enamel, occur usually in the mandible, but have also been found in the maxilla. The tumor consists of spaces lined with epithelium, which are developed as irregular outgrowths from the enamel organ. They may grow to an enormous size. Follicular odontomas are produced by the development of a cavity around a misplaced or ill-developed permanent tooth. A radicular odontoma is a tumor composed of cement substance which develops at the root of a tooth. A composite odontoma is derived from the whole tooth germ and consists of a conglomeration of the various tissues entering into the formation of the tooth, so intermingled that the individual tissues can not be distinguished. These growths develop in the jaws and may attain a large size. The germ of any permanent tooth may develop into an odontoma, or two or more teeth may be involved in one tumor.

The eruption of an odontoma usually occurs between the 20th and 25th year of life, these tumors having a well-marked tendency to remain quiescent for a long time. The diagnosis of these growths after they appear above the gum is difficult, and they have very often been taken for a myeloma, a sarcoma, or a piece of dead bone. The use of the x-ray is by far the best method of diagnosis.

Dental cysts, in the form of fibrous sacs containing cholesterol crystals, are sometimes found at the root of a dead permanent tooth, in both the lower and upper jaws; in the latter, they often invade the antrum and simulate a local abscess. They are usually small, the size of an apple seed, and are met with in extracting pulpless teeth. Treatment consists in the removal of the roots and the scraping of the cyst wall; when the cyst has invaded the antrum, a small portion of the bone must be removed to afford easy access to the cyst cavity.

A single case of cancer of the pericementum is on record in the literature.

Excision of the maxilla proved necessary and was performed in 1901; the patient, a young woman, fully recovered and today wears an obturator.

**Some Aspects of Maxillary Antrum Disease.** W. Barrie Brownlee. *British Medical Journal*, October 12, 1918, p. 403.

The relation of antrum disease to surrounding diseased organs is illustrated by the author by means of four cases in which the antrum disease was the primary infection or at any rate, its presence prevented these structures recovering under the usual methods of treatment. The first two patients were women of 31 and 26 years, respectively; in the former, who suffered from dacryocystitis and antrum disease, the performance of a double radical antrum operation was followed by a return of the lacrimal condition to normal within a week after the operation. In the second case, the ear discharge (which had persisted since the performance of a radical mastoid operation two years previously) disappeared within a month after a radical antrum operation with the intranasal frontal sinus operation and removal of the anterior ethmoidal cells on both sides. A double antrum operation proved equally successful in the case of a boy twelve years of age with otitis media and antrum disease, and in a boy of fifteen years suffering from left supraorbital pain, deviated septum and antrum disease.

The radical method of operation, type Caldwell-Lac, was adopted by the author in all these cases, the technic employed being that of De W. S. Syme of Glasgow. By this method a better view is obtained of the interior of the antrum, and the vertical incision has many other obvious advantages; moreover, the whole operation can be done with comparative comfort to the patient under local anesthesia, preceded by a hypodermic of morphine or omnopon. The great advantage of the method is that it is practically bloodless, whether done under local or general anesthesia.

The chief point regarding the last two cases is the age of the patients, twelve and fifteen years. Antrum disease is by no means uncommon in children about this age, or even younger, and a nasal discharge at this time of life is often correctly put down to the presence of adenoids; but if the nasal discharge does not cease within two months of the adenoid operation, a careful examination of the nose will frequently reveal the cause of the trouble in the presence of a deviated septum or antrum disease, or both combined.

**Iodine in Dentistry.** L. E. Payne. *The Dental Surgeon*, 1919, xvi, 106.

The great antiseptic and powerful bactericidal properties of this drug are emphasized by the author, who points out that an immediate application of iodine may be relied upon as a sure preventive of infection, in case of slight wounds or injuries of the mouth during the performance of dental operations. In the presence of dental caries, a few drops of iodine tincture in a small tumbler of warm water have an excellent effect, acting as a very useful mouth wash. As a precaution against infection of the sockets, in the extracting of septic teeth, a solution applied to the gums before and after the operation is most effective. In pyorrhea alveolaris, iodine may always be advantageously applied

to the gum pockets after thorough cleansing has been accomplished, and in this disease it undoubtedly acts as a counter-irritant as well as an antiseptic and bactericide. As a counter-irritant, iodine relieves periodontitis and pulpitis, and reduces all inflammatory conditions. Discoloration of the patient's mouth and lips may be avoided through liberation of the iodine by the use of hydrogen peroxide as a wash. Iodine penetrates deeply into the tissues and is absorbed very rapidly. It should not be used indiscriminately or in too great a quantity, as some patients are very susceptible thereto.

**The Syndrome of the Retro-Parotid Space.** M. Villaret and Faure-Beaulieu, *La Presse Medicale*, 1918, 26, p. 591.

This syndrome is characterized by evidence of involvement of the hypoglossal nerve, giving rise to hemiatrophy and paralysis of the tongue, of the sympathetic nerve, causing exophthalmos and narrowing of the palpebral fissure, with miosis; of the pneumogastric nerve as shown by paralysis of one vocal cord; and of the glossopharyngeal nerve, giving rise to disturbances in taste. The knowledge of this syndrome, which was noted by the authors in four cases since the beginning of the war, is not merely of theoretical interest, but permits the exact localization of the injury. The so-called syndrome of the posterior lacerate foramen is not associated with involvement of the sympathetic nerve, barring a few exceptional cases.

**Plastic Surgery and Prosthetic Appliances on the Terminal Treatment of Severe Facial Mutilations.** L. Dufourmentel. *Paris Medical*, 1919, ix, No. 12, p. 229.

In a general way, the operator should be guided by the rule to carry his repair work as far as possible, the prothesist not starting on his permanent work until the surgeon leaves off. Surgical repair alone is not satisfactory unless it restores to the face, objectively, a normal configuration, subjectively the exercise of the various functions, such as mastication, phonation, nasal respiration, closure of the eyelids, etc. The role of the prosthesis begins when these conditions can not be realized. Its results are especially valuable from the objective viewpoint; for physiologically, it can replace merely the function of mastication, and that only in those cases where the lower maxilla and its motor apparatus have been spared, the prosthesis concerning only the dental system. Anatomically its benefit may be considerable, although fortunately cases of this kind are of exceptional occurrence. Among several thousand wounded soldiers with facial injuries, the author knows of no more than fifty for whom it was necessary to supplement the grafts by the application of a more or less extensive face mask. In all cases and varieties of facial destruction, the surgical treatment must and can obtain this result that the traumatic gap, no matter how extensive, becomes entirely covered with integument. There exists no mutilation compatible with survival in which this covering of the lesion is not practicable, it is absolutely essential to the patient's life and to the possibility of easily wearing a face mask. The latter will at best be never more than an object of external adornment, and

the surgeon must always aim at the minimum result that no more dressings have to be worn, which means that the gap in its entire extent must be covered with healthy skin. The rapid progress of reconstructive surgery and the constant invention of more and more intrepid procedures hold out the promise that the indications for prothetic apparatus will continue to diminish, although their total disappearance is not yet in sight.

**Focal Infections in Childhood.** S. Blum. *The American Journal of the Medical Sciences*, 1918, clvi, p. 681.

Upon the basis of his investigations the author concludes that focal infections may be created by operative procedures such as tonsillectomy and orthodontia. Complicated mechanical apparatus employed in orthodontia for straightening the teeth affords excellent opportunities for bacteria to congregate, and the forcing of teeth about in their alveolar sockets opens to the assembled bacteria inviting avenues for invasion. Nervous and digestive disorders result. The author has seen cervical adenitis traced to tooth manipulation. Warning against the creation of foci of infection by operative interference, he emphasizes that the teeth and tonsils should not be indiscriminately removed before their activity as a seat of focal infection has been positively established.

**Plastic Repair of Large or Total Defects of the Upper Lip.** J. Joseph. *Münchener medizinische Wochenschrift*, 1918, No. 46, p. 1287.

The current methods of plastic restoration of large or total defects of the upper lip vary greatly, according to the sex of the patient. In men who should at the same time attempt to grow a beard, the best methods consist in the formation of long tapering flaps from the skin of the cheeks and neck; furthermore, the transplantation of a pedunculated flap from the skin of the head, with substitution of the mucosa from the cheek adjacent to the defect (author's method) or from the skin of the forehead adjoining the scalp (Lexer). A very reliable procedure especially recommended by the author, is the transplantation of a bridge-flap from the scalp, with pedicles at both ears, and containing the two temporal arteries; with replacement of the mucosa from the cheeks or possibly from the neighboring frontal skin; or through preliminary transplantation of a free epidermis flap under the loosened scalp. Some surgeons believe in drawing together a number of bridle-like flaps cut square out of the cheeks, but this procedure is unconditionally rejected by the author for large, more particularly total defects of the upper lip, the operation being usually unsuccessful on account of overstretching of the flaps, while the prospects of the other plastic methods are impaired by the remaining cicatrices. In women, where scarring and hairiness of the face must be avoided as well as possible, primary transplantation from the skin of the upper arm enters primarily into consideration, assisted if necessary by a pedunculated flap from the skin of the lower chin.

Repair of the upper lip by means of tapering skin flaps from the cheeks and

neck was successfully carried out by the author in five cases of war injuries, in two of which, moreover, considerable gaps of the red upper lip were repaired from mucosa of the lower lip.

**A Noteworthy Affection of the Upper Incisor Teeth.** L. Dubreuil-Chambardel. *Bulletin de l'Academie de Medicine*, 1919, lxxxi, 84.

In the course of twenty years, the author was enabled to observe a noteworthy dental condition in forty individuals of both sexes. Beginning at the approximate age of fourteen years, the affection makes its appearance in the form of simultaneous caries of the four maxillary incisors. The dental caries take a rapid course, until by the end of four or five years, this group of teeth has been definitely destroyed. An unusually pronounced type of ogival arch was noted in the palate of eighty per cent of these cases, harelip was present in two instances.

The same carious condition of the maxillary incisor teeth was also observed in six of nine skulls in which the premaxillæ had failed to fuse with the maxillæ. (These nine cases were encountered in the study of twelve hundred skulls.) This incidence of caries is referred by the author to the creation of a lowered resistance through the persistence of the premaxillary bone as an independent structure, which is associated with a persistent infantile type of arterial blood-supply to the four maxillary incisor teeth. Imperfect nutrition must be held responsible as the immediate predisposing cause which permits the establishment of the carious process. The teeth of the upper jaw receive this blood supply from two different sources. The anterior dental artery, a branch of the sub-orbital artery, supplies the incisors and sometimes the canine tooth. The posterior dental arteries, branches of the alveolar artery, usually supply the canine and regularly the premolars and the molars. In the fetus and young child these two arterial systems are independent and the anterior dental artery has a more considerable size than the posterior dental arteries. Gradually, more and more important anastomoses become established between the different arteries, while the system of the posterior arteries comes to predominate at the expense of the anterior plexus. In the adult, the anterior artery is considerably reduced in size and receives a strong anastomotic current which extensively serves its area of supply.

**Neuritis of the Trigeminal and Facial Nerve.** H. Morat (Oestern, *Ungar Vierteljahrsschrift für Zahnheilkunde*, 1918) *Revue Suisse d'Odontologie*, 1918, xxviii, No. 4, p. 251.

In the case observed by the author, the trigeminal inflammation was characterized by sensory disturbances, while the facial neuritis manifested itself, proportionately to its spreading in a central direction, in the form of progressive paresis of the facial muscles, including the levator palpebrarum (ascending neuritis). The involvement of the nerves followed as a sequel after inappropriate treatment of the diseased pulp of an upper eye tooth. This had

apparently led to periodontitis, as well as cauterization of the mucosa, finally necessitating the extraction of the tooth. The origin of the neuritis is referred by the author to the presence of a disintegrated putrefying cotton pledget in the wound cavity and to the severe traumatization of the tissues.

### ***RADIOGRAPHY, Etc.***

**Radium in the Treatment of Carcinoma of the Buccal Cavity.** R. B. Greenough, Boston Med. and Surg. Jour., May 2, 1918.

The report deals with a total of 139 cases of mouth cancer, but not all of them were subjected to radium treatment. For example, of *cancer of the lip* there were 39 cases, but only 19 were given radium treatment. Of these, there was complete disappearance of the tumors in 4 and improvement in 4 others. The remaining 11 cases obtained but little benefit. *Cancer of the palate*, 8 cases; *cancer of the tonsil*, 7 cases; *cancer of buccal mucosa*, 5 cases. Of these 20 cases in all, 12 had radium treatment. No case showed anything more than temporary and symptomatic benefit, and the disease progressed with little or no delay to a fatal termination. *Cancer of lower jaw*, 36 cases; *cancer of antrum and upper jaw*, 11 cases. Of these 47 cases in all, 28 had one or more radium treatments. The upper jaw cases were all refractory and the disease was not materially influenced by radium. Six of the lower jaw cases had definite benefit from radium, and in one case, a local recurrence after operation, the disease was destroyed and no further recurrence has appeared in 20 months. *Cancer of tongue and floor of mouth*, 33 cases, 22 of which were given radium treatment. Definite improvement took place in 3 cases, but the disease was not eradicated. *Leucoplakia buccalis*, 8 cases, 4 being treated by radium with a certain amount of success. It is unquestionable that radium employed in sufficient strength can cause a disappearance of the milky mucosa, but only by an actual caustic action.

**Radiology.** A. Lloyd Kitchin. The New Jersey Dental Journal, 1919, viii, No. 3, p. 86. (Illustrated.)

Dental radiography is the science and art of making and interpreting radiographs of the teeth and associated parts. The author considers this important subject under four headings, as follows: (1) Manipulation of machine and tube. (2) Posing patient, placing plan and focusing tube. (3) Time of exposure. (4) Finishing negative. He emphasizes that the use of the radiograph in dentistry is not a mere fad, but a necessity if one wishes to render efficient dental service. The time of exposure ordinarily used in dental radiography is insufficient to produce any ill effects. A time exposure limit of two minutes, at ten to twenty milliamperes, at a distance of sixteen inches from the target to the patient is safe. A high tube, or one emitting rays of great penetrating power, is less dangerous than the weaker tube. Tubes that require 12 to 15 or more seconds an exposure for dental work, may cause a slight irritation after radiographing every tooth in the mouth (ten or more films).

In the realm of orthodontia, the radiograph is positively essential: (1) To determine the position of unerupted permanent teeth. (2) To determine how far to move teeth. (3) To observe moving teeth. (4) To locate impacted and supernumerary teeth. (5) In some cases to determine the cause of malposition of a tooth.

The following is a list of common errors in reading radiographs: (1) To mistake the mental foramen for an abscess of a lower premolar. (2) To mistake the anterior palatine foramen for an abscess. (3) To mistake the nasal cavity for necrosis of the palate. (4) To mistake the antra for abscesses. (5) To mistake the mandibular canal for a fistulous tract. (6) To mistake a cervical filling for a pulp stone. Proficiency in the interpretation of radiographs is only gained by continued observation.

**Roentgen Ray Indications for Tooth Extraction. B. C. Darling. The American Journal of Roentgenology, 1919, vi, No. 3, p. 136.**

The roentgenogram shows when the condition about the infected tooth is such that it menaces the health of the patient. The trained roentgenologist can diagnose the condition which indicates extraction. This he should prescribe, as at present no other method can be guaranteed to remove the focus of infection. Dental research is still working to find a completely aseptic method that will save the tooth and at the same time remove the focus of infection. But under present conditions, the weight of medical and dental practice is in favor of extraction if this is necessary to destroy the focus of infection. According to Dr. Harold L. Vaughan, extraction followed by surgical removal of the infected area is indicated in the vast majority of teeth showing periapical infection, and the routine conservative methods at present fall far short of the requirements in the removal of foci.

Dentists should be aware of the limitations of the roentgen ray examination and use every additional clinical method available. Roentgen rays are of the greatest value in diagnosis. The fact that the roentgenogram is necessary to and often decisive in diagnosis emphasizes the importance of its being made by a trained roentgenologist. Although mistakes in interpretation are always possible, the x-ray picture may be credited with possessing definite value as an indicator of the need for extractions and root amputations. "The diagnosis should be based primarily on the roentgen ray findings tempered by the clinical experience gained by the study of roentgen rays of other cases where the teeth and infected tissues had subsequently been removed giving a chance for comparison."

Extraction is required for the great majority of teeth showing periapical infection, as well as for teeth showing periodontoclasia or absorption of bone of the alveolar process by disease, as indicated on the film by the black line of pericementitis.

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## EDITORIALS

### Shall the Classification of Dental Schools be Permanent?

SINCE the signing of the armistice, there has been considerable discussion in the dental profession, as to whether the classification of the dental schools as adopted by The Dental Educational Council of America, July 31, 1918, should be permanent. In reviewing the arguments for and against the permanency of this classification, it is very easy to see that those who are in favor of keeping the classification are men who are connected with Class A schools, and those who oppose it are those affiliated with Class B schools and other members of the profession who are broad-minded enough to see the inefficiency and unfairness of the classification as made by the Dental Educational Council of America. It has been a grave question in our minds, whether the necessity for the classification of dental schools as outlined by men from the war department ever existed.



If a necessity for that classification existed as a war measure, that necessity is entirely eliminated with the close of the war, as the classification was made for a working basis so they could decide which schools should be allowed exemption privileges for their students and which schools would not be allowed such privileges. Whether the classification in the first place was a wise thing as regards the schools, dental students, and the dental profession is an open question, but anyone who is familiar with the classification of schools as made by the Dental Educational Council of America, and who is fair, will admit that the classification is based upon an unsatisfactory rating, and consequently is one that is not going to do the dental profession any permanent good.

In looking over the list of schools that have been placed as Class A, and those that have been placed as Class B, we are confronted with some very interesting facts, and some which can not help but show why such a classification is unfair to the various dental schools, which have been given a Class B rating, and which also places some schools in Class A that should not be there, if judged according to the value which they and their faculty have rendered the dental profession in times past. In the first place the general plan for classifying these schools was entirely wrong, because the principal thing that was considered was that each school should possess a certain amount of equipment, or an equipment of a certain value for each student enrolled. It necessarily follows that upon that basis the schools with the smaller enrollment would be more apt to be placed in Class A than the large schools with the greater number of students, and this is exactly what has occurred. Such a classification will do the profession no good, because it has taken a wrong standard. A school can become a Class A school that has a small number of students and an equipment that is no more valuable than one which is placed in Class B because it had a larger enrollment. Again this classification was unjust and unfair, for it failed to take into consideration the past history of the school as related to the number of graduates that were successful in passing the state boards, and also failed to take into consideration the standing or rating of the faculty of the various schools. For instance a large number of Class A schools obtained their rating entirely upon their equipment, but if they had received their rating from the number of students that have been able to pass the state board over a period of ten years, or, if there had been taken into consideration the professional standing of the men composing the faculty, the schools would not only have dropped into Class B, but a number of them would even have been placed in Class C. For instance, we find some schools rated as Class A which have shown before state boards as high a percentage of failures as 30 per cent. We also find certain Class A schools with men on their faculty who have never done anything for the dental profession, have never made for themselves an enviable name or reputation, in fact, the faculty is composed of men that have never been able to do enough in the dental profession to have received any national recognition. We, therefore, contend that the basis of the classification is radically wrong, because it has placed a value on equipment, which may consist of electric lathes and fine work benches, and has paid no consideration to the personnel of the faculty or the product which the school has turned out, namely, graduates.

We believe the most important factors in making a rating of dental schools

should be the number of graduates that have been able to pass the board, and second the professional standing of the men composing that faculty; any rating or classification which does not consider these things, is necessarily a faulty and useless one.

The Dental Educational Council of America was also influenced in rating schools by the selecting of a curriculum and the naming of a certain number of subjects which should be taught. A few of those subjects do not add any professional value to a dental education. Also, some of those subjects as named, were contrary to requirement which had been laid down by the Commissioners of Education of some states as governing dental education, with results that certain colleges could not teach those subjects, because the subjects recommended should have been taught before the student came to dental college. Consequently schools in those states regardless of the number of students that were able to pass the state board each year, regardless of the amount of equipment that they possess, and also without any consideration of the prominence of the men that compose the faculty were placed in Class B according to the aristocratic and autocratic action of the Dental Educational Council of America. Any classification of schools, medical or dental or others, that is based upon the amount of equipment is wrong and misleading, and is not going to be a wise and good thing.

Anyone looking over the classification of dental schools will be impressed with the fact that the personnel of the faculty has had absolutely nothing to do with it, and in fact such a thing was not mentioned in the requirement for classification as laid down by the Dental Educational Council of America. Neither was any stress laid upon the fact that certain percentage of the graduates of the school should pass the state board examination. In other words the two most important things have been neglected, namely, the ability of the faculty to instruct students, and the ability of the product of that college to render a valuable service to the public. The thing that was considered was the most unessential and invaluable, namely, the amount of money which had been invested in equipment for students. In calling attention to some of the injustices which have been done in the classification of dental schools as made by the Dental Educational Council of America, we find that both of the New York Dental Schools have been placed in Class B owing principally to the fact that the Commissioners of Education of New York require that the dental schools teach certain subjects and that they must not teach other subjects. On account of this alone they were forced to be placed in Class B, and second, the attendance of both of these schools was large and we doubt whether they had sufficient property pro rata for each student enrolled. On the other hand, schools that have a small enrollment have been given a Class A rating because they had a very small number of students.

Again we find dental schools that have done a large amount of good for the profession, schools with a large alumni and which have turned out a large number of graduates who have successfully practiced dentistry and rendered a valuable service, schools that have men on their faculty with international reputations have been placed in Class B because they did not fulfill the autocratic and unfair requirements set down by the Board of the Dental Educational Council

of America, namely, a fixed amount of equipment for each student. Going over the list we were first impressed by the fact that the Chicago Dental College, Washington University, St. Louis University, Vanderbilt University, University of Buffalo, Indiana Dental College, and a large number of other schools that have rendered valuable service to the profession have been placed in Class B. During the last few years there has been no dental school in America that has possessed so valuable or so good a faculty as the Chicago Dental College. On the faculty of the Chicago Dental College there have been more men who have written textbooks and are international authority, than any other college in America. We need only to mention Brophy, Johnson, Case, Logan, Buckley, Roach, Hall, and Borland, all of whom are recognized authorities, which shows the faculty has been second to none, yet it was given a Class B rating.

The question might be asked, why have some of these schools in Class B such a large attendance year after year? The principal reason has been that they have possessed a faculty which has been attractive to the students, and have been able to turn out graduating classes that were successful in passing state boards and rendering a service to the public. This is much more than can be said in regard to a number of schools that have been placed in Class A that possess faculties composed mostly of men who are unknown beyond the "city limits" and also who have turned out graduating classes that have been unsuccessful to a great extent in passing state boards. We are aware of the fact that a large number of the schools that have been placed in Class A pay particular attention to the marble halls, ball-bearing lathes, electric engines, fountain cuspidors, and cabinets, all of which are used to greatly impress the freshman student, and to make him believe that a fine building and beautiful equipment is all that is necessary for him to learn dentistry. Anyone who is familiar with the demands of dental education, realizes that nothing could be more untrue or unfair to the freshman or prospective dental student, than to befog his mind with any such issue.

The important and most necessary vital thing in the teaching of a dental student is that the faculty be composed of men who have been successful in their various lines of work, men who because of long years of service have demonstrated their ability to teach dentistry in such a manner that dental students can pass the state board examinations and be a success in their chosen profession. It matters not how fine the equipment may be, unless the faculty possesses the requirement which we have mentioned, the dental school is going to be a second rate or a third rate school based on value it renders the public, even though it is placed in Class A because of the fine equipment.

We are perfectly willing to admit that probably a classification of dental schools is advisable, but we insist that in fairness to the dental profession and dental students, the most important thing in considering that classification be based upon the professional standing of the faculty, and the results produced in the student body. In other words, the most important thing to make the dental education a success is the standing of the men teaching the students, and secondly the ability of the student to go out and render a service to the public, first by passing the state board, and then performing an efficient dental service. Because those last two features were not considered in the classification of dental

schools by the Dental Educational Council of America, July 31, 1918, we believe the classification made at that time possesses no value, and that any dental school which still holds up that rating as evidence of superiority is taking advantage of the students, placing themselves upon a pedestal which they are not qualified to occupy, unless they can fulfill their sphere in life with relation to the other two requirements we have mentioned. At the present time we are very sorry to say, that too much attention is being given to fine equipment in dental schools, that can be bought with dollars and cents and which can be rated in commercial terms, and not enough is given to selecting of a faculty able to deliver to the students the things they should know, and the things which are going to be a benefit to them and to the public when they finish their professional training. In other words, an autocratic classification by an educational council based upon the value of equipment for each student is not going to take the place of an intelligent faculty, made up of men who have demonstrated their ability to teach dentistry as it should be taught.

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### **New Orleans and the National Dental Meeting**

**I**N accepting the honor of entertaining the National Dental Association, October 20-24, New Orleans feels that it can discharge the responsibility in a manner most satisfying to every delegate. This will be one of the most important gatherings of the year and every effort will be put forth to impress upon the visitors that the famed hospitality of the South is yet a dominant factor in its life.

In New Orleans 1919 shakes hands with 1719 every day.

One side of the city is a hustling, swarming American metropolis. The other side is a page from yesterday; a soul-stirring relic of bygone centuries; a glimpse far into the background of time; an old canvas daubed with the mellow colors of France, Spain, England and America blended into a harmony of history.

Fabulously wealthy in authentic historical episodes, New Orleans offers to national dentists an opportunity to study a famous past which no other American city affords. The scenes of history, the buildings of history on the sites of history are vital and living—preserved through two centuries for the eyes of 1919 to view as the eyes of 1719 viewed them.

What will you see in New Orleans?

This, my friend, and much more:

Scene of the Battle of New Orleans on Chalmette field; General Sir Edward Pakenham's headquarters in which he died of wounds after the battle; levee scenes where Farragut steamed up the Mississippi to find millions in cotton and molasses ablaze along the levees; the old Cabildo whose stone-paved rooms Lafayette trod, under whose roof took place the formal transfer of the province of Louisiana from France to the United States; the ancient St. Louis Cathedral where General Andrew Jackson bowed his head in the "Te Deum" that celebrated his victory in the Battle of New Orleans; Jackson Square where landed the

exiled Acadians made immortal by Longfellow in *Evangeline*; French Market, gathering place of slaves and their mistresses in the dim, dark past; Old Absinthe House built in 1789 and still a favorite resort; the house built for Napoleon who was to be rescued by a Louisiana crew; the old French Opera, the first ever built in America; Jean Lafitte's blacksmith shop and the Archbishopric, the oldest original building west of the Alleghenies.

Nor are these all the historical settings in New Orleans. There are streets lovely with the lace-like arabesque of iron work galleries made by Creole artisans. There are white-pillared houses with broad galleries of ancient times. There are parks that were plantations. There are restaurants and coffee houses descending through five generations of chefs from father to son, with the old quaint customs.

And while old New Orleans, because of the charm of its ancient tradition and its romantic history, offers the visitor a rare opportunity for enjoyment, modern New Orleans none the less affords a big attraction.

Fourteen miles of steel and concrete, weather protected docks facing the greatest inland harbor of the world; gigantic warehouses and grain elevators equipped with all the machinery which modern science has invented; a thirty-two foot deep navigable Canal stretching out through the very heart of the city from the banks of the Mississippi to the shores of Lake Pontchartrain, providing water frontage for all manufacturing sites; great shipbuilding plants already at work, employing thousands of men on the banks of this Canal; a wonderful climate, assuring twelve working months to each year, a perfectly drained and sewered city with hundreds of miles of paved street, rat-proofed homes and yards—this is partially the story of modern New Orleans,—the New Orleans which the rest of this country knows so little about!

Its people have seriously taken the big tasks of a new day, and their dream is to make certain the prediction of a great man who recently visited us when he said:

"The city is destined soon to become not only the second port but in all probability the second city of America."

This is the half-told story of the old and the new New Orleans, the story which such a limited number of people know. It is the story of a great American city, "living, breathing, and growing greater every hour."

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## ORIGINAL ARTICLES

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### A PRELIMINARY STUDY OF THE EFFECT OF RICKETS ON THE JAWS\*

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BY HUGH K. HATFIELD, M.D., D.M.D., BOSTON, MASS.

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IN presenting this report on "The Effect of Rickets on the Jaws" no attempt has been made to include an exhaustive bibliographic review of the subject, but simply to give *first* an outline of some of the characteristic features and deformities seen on other parts of the body, together with some recent observations and conclusions of men studying the roentgenologic evidences of the disease; *second* to recall to your mind some of the recorded observations and assertions made regarding its deforming action on the *jaws* and as an etiologic factor in malocclusion. *Third* to show models of the teeth and jaws of the group of rachitic children under observation.

Rickets was recognized and accurately described more than two hundred years ago, yet today its etiology is obscure and its relation to diet is not clear.

McCollum<sup>1</sup> says: "It is a disease of the first two years of life, and is especially prevalent in children in whose diet milk is replaced too largely by cereals and other vegetable foods not suited to the delicate digestive tract of the young child." The nutritional disturbances often leave the child delicate and emaciated and the muscles soft and flabby. One of the earliest diagnostic signs to appear is the "rosary," the row of nodules which form at the junction of the ribs with their cartilages, and, though not always seen, can usually be felt when present.

A common deformity is the flattening of the sides of the chest with a prominence of the sternum, "pigeon breast," so called. When these are sharply defined and the abdomen is distended, a marked depression appears called "Harrison's groove," running from one side to the other about the level of the diaphragm. The head appears sometimes larger than normal and the prominent frontal emi-

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<sup>1</sup>Read before the Nineteenth Annual Meeting of the American Society of Orthodontists, St. Louis, Mo., March 10-12, 1919.

nences when they develop give the head a characteristic square-shaped look and can be readily distinguished from a hydrocephalic head which is symmetrically rounded.

The deformities seen in the arms and legs are sometimes extreme. The same epiphyseal disturbance responsible for the "rosary," enlarges the ends of the bones in the ankles and wrists. The legs may show all degrees of bow-legs, or knock-knee, and are sometimes bent in other directions. The arms also may be twisted and bent. A general rounded curve involving the whole spine may develop, or there may be a general collapse of the column.

It can be readily seen from this description that the most important and characteristic changes show in the bones, which are generally softened throughout the body during certain stages of the disease. Probably owing to some chemical change, an imperfect deposit of lime takes place. The new bone formed as the child gets better seems harder than normal, the so-called eburnated bone. Although comparatively little is known of the pathology of the disease the roentgenologic investigations of the bone changes are very interesting especially in the matter of differential diagnosis.

Lovett's<sup>2</sup> contribution published in the *Journal of the American Medical Association*, December 11th, 1915, is highly instructive and appears to have been the first attempt to trace the stages of rickets through a definite roentgen sequence. His comparative study of 500 or 600 plates of rickets showed the disease to divide itself naturally into three stages. The knee joint offered the most favorable conditions for study but the same manifestations are found in the other joints of the body.

In the first, or acute stage, the joint appeared cloudy, the epiphysis casting little or no shadow and the diaphyseal ends frayed out instead of clear cut. A severer type showed a general bone atrophy in the diaphysis and pronounced periosteal thickening.

In the second stage the epiphyseal shadow becomes more marked, the end of the bone broadens out into a lip or ledge, especially on the side on which the strain is greatest. Cortical thickening on the concave side of the curved or bowed shaft is in the nature of a compensatory change in the bone structure.

The third stage carries through the period of convalescence. Epiphyses are clearly outlined and ossified and there is increased density of the bone. The thickening of the periosteum in the earlier stages clears up and shows no tendency to bone formation.

This is about all the pathology known and has been largely obtained through this very practical means of study with the roentgen ray.

Bringing the subject now into our special field, one finds in the current literature and orthodontic textbooks the following conception of the disease:

*Rickets*, characterized by a faulty development of bone, is a very important etiologic factor and deforming agent in malocclusions. It delays the eruption of the deciduous teeth which are in turn lost early with resulting malocclusion in the second dentition. There is faulty development of the alveolar process and of the bones of the mandible and maxilla. The marginal ridges of process are thickened and rounded.

Incisors of the upper jaw usually small, soft and friable. Permanent teeth damaged before their appearance, showing erosions on body and cutting edge. The upper jaw narrowed or V-shaped in form. Palate high vaulted and teeth crowded. Lower jaw shortened or trapezoid in form. Upper alveolar processes have a tendency to turn out. Lower alveolar processes to turn in. Of these signs the narrow or V-shaped upper arch with high vaulted arch palate seems to take first place as a characteristic deformity of rickets.

By way of clearing the ground for further investigation of the subject and that no doubt might exist in my mind as to the presence of these malformations I examined a group of ricket cases and made models of the jaws of every child in the group.

Material for study is usually easily obtained when once the subject for investigation is selected and planned. It is to be always borne in mind, however, that etiologic problems are still so complicated that frequently a subject is chosen for investigation which embraces so large a field that interpretation of the findings is difficult and the meaning of the data obscure. For this reason special effort was made to confine this study to a group of children with a clear diagnosis of rickets and in whom the characteristic deformities of the disease had developed. This group was found in the Massachusetts Hospital School for Crippled Children.

In most of the cases, so far as the histories could be obtained, the first indications of the disease appeared during the first and second years, and as will be intimated in the description of the illustrations, the deformities resulting were of rather a severe nature and distributed pretty generally throughout the group.

No attempt was made to determine the amount of disturbance in the order and date of eruption of the teeth or premature loss of the deciduous teeth. It would hardly be safe to make a diagnosis of rickets on this feature alone without considering the wide range of physiologic variability and the hereditary and individual peculiarities of the child.

It would naturally depend upon the date of the origin of the disease, but where there seemed to have been a premature loss of the teeth, no special disturbance in the development of the jaws was noted.

Furthermore, a careful study of each case seems to show nothing in the nature of jaw formation which might be called characteristic of the disease, and instead of the narrow or V-shaped and high vaulted palate, the arch forms seemed well within the limits of the normal.

In the 150 children in the school, only 15 cases of rickets were found and I will suggest the severity of each case in the accompanying illustrations:

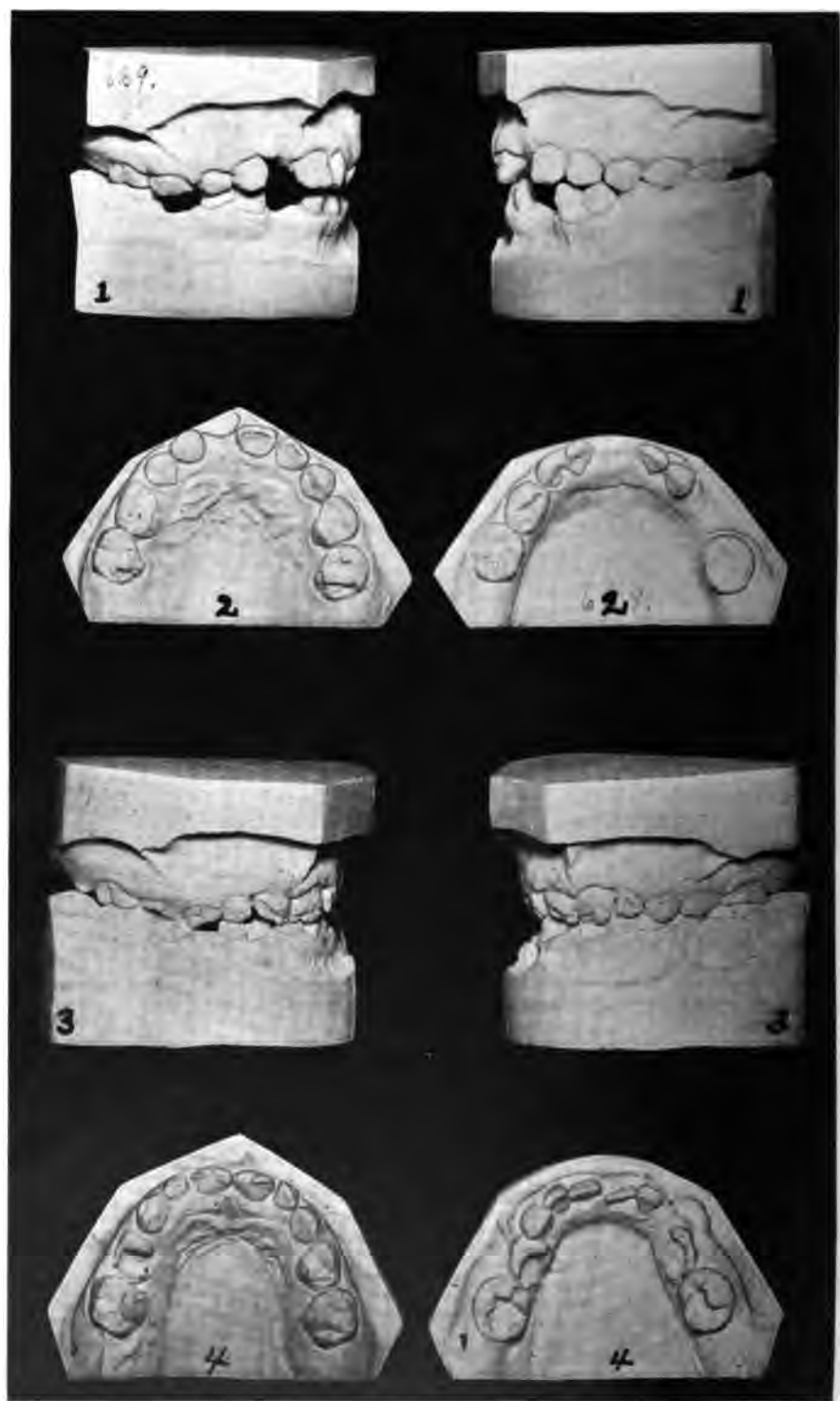
Figs. 1 and 2. Girl five years old, admitted in the hospital two years ago. Badly deformed arms and legs; knock-kneed, no marked deformity in the arch formation.

Figs. 3 and 4. Girl five and one-half years old—normal occlusion—well-formed arches.

Figs. 5 and 6. Girl seven years old. Admitted in 1916. Rather severe case—flabby muscular condition. Could not walk when admitted.

Figs. 7 and 8. Girl seven years old. Admitted in 1916. Scoliosis—"rosary" and other signs.





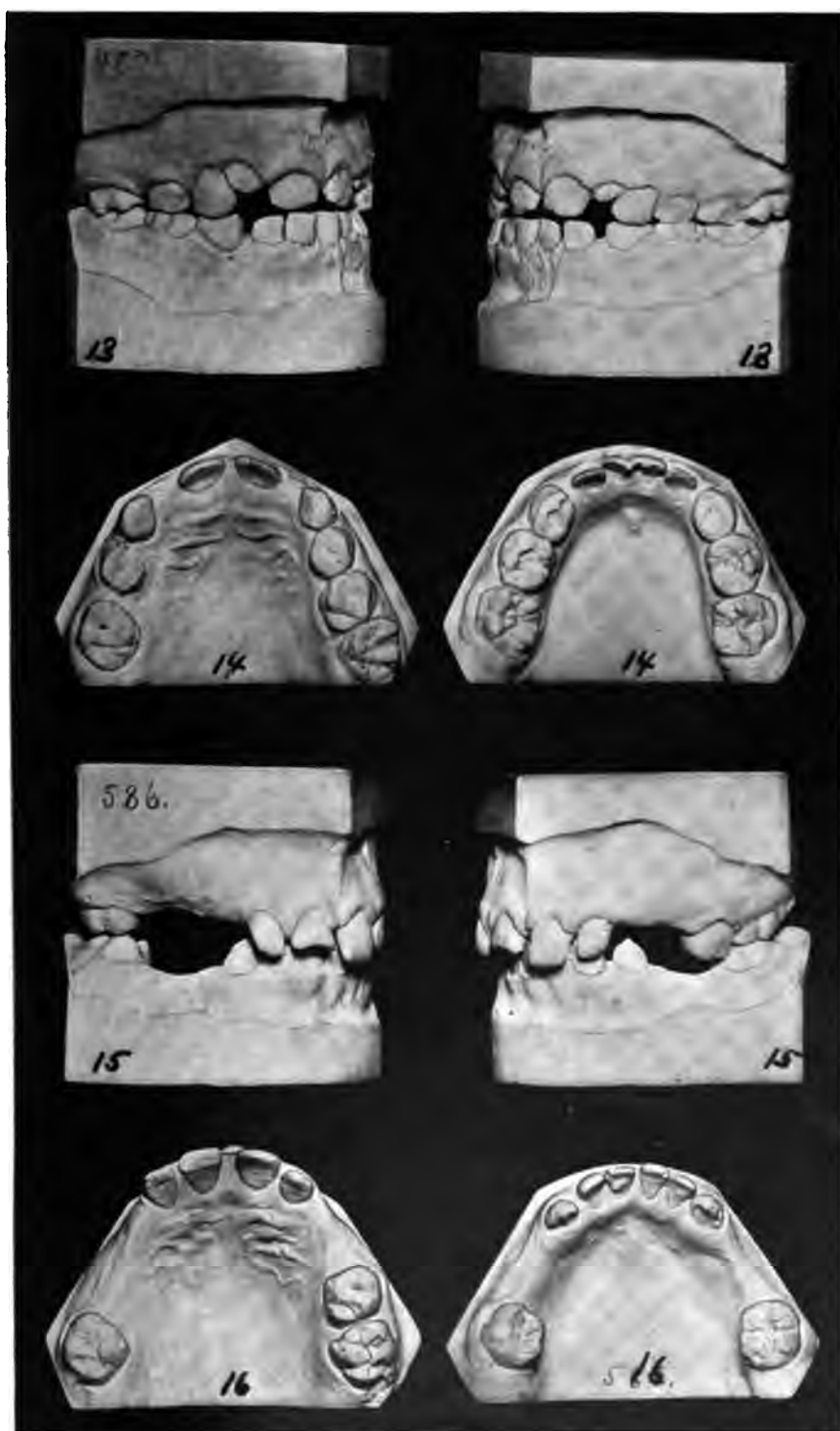
Figs. 1 to 4



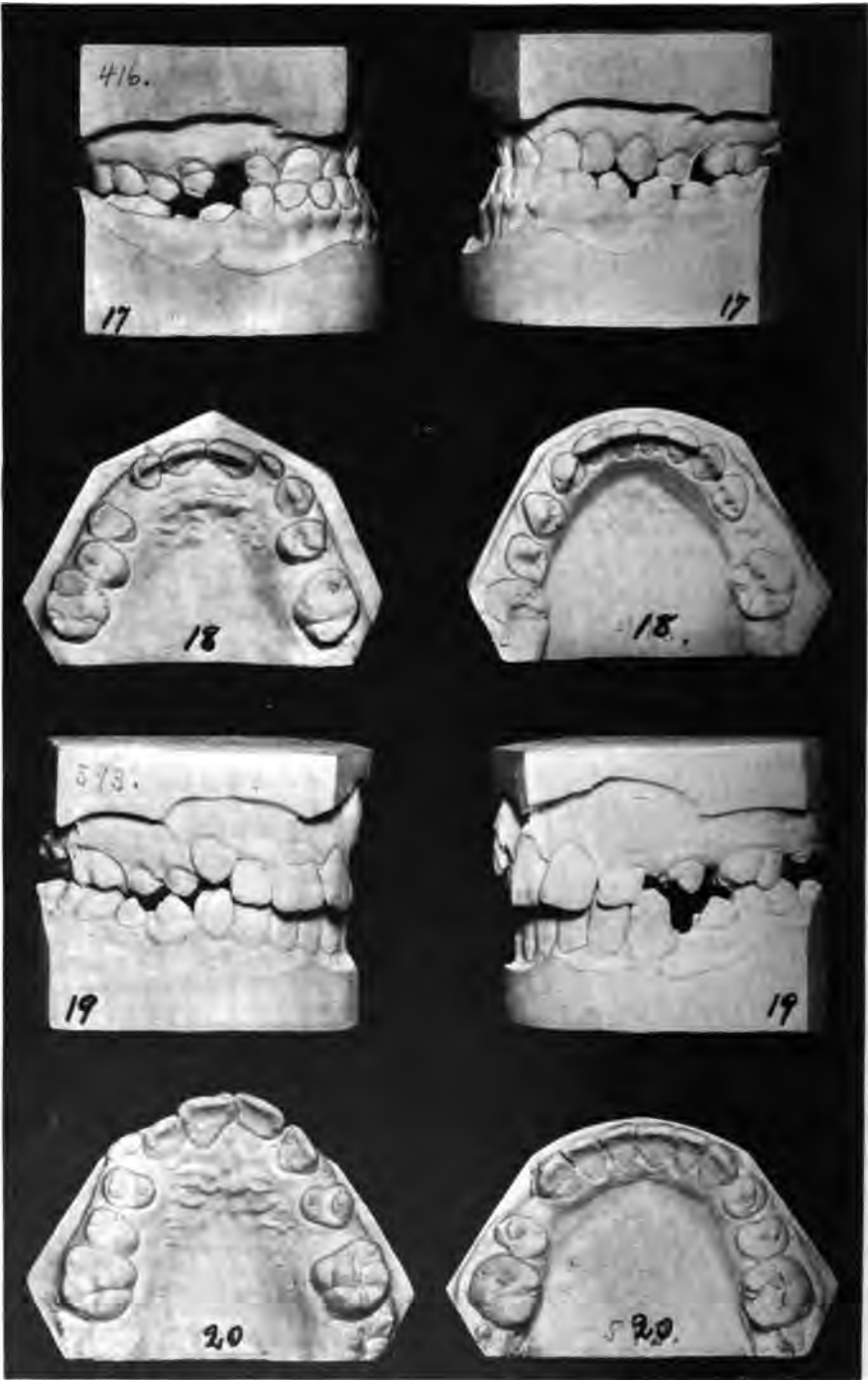
Figs. 5 to 8



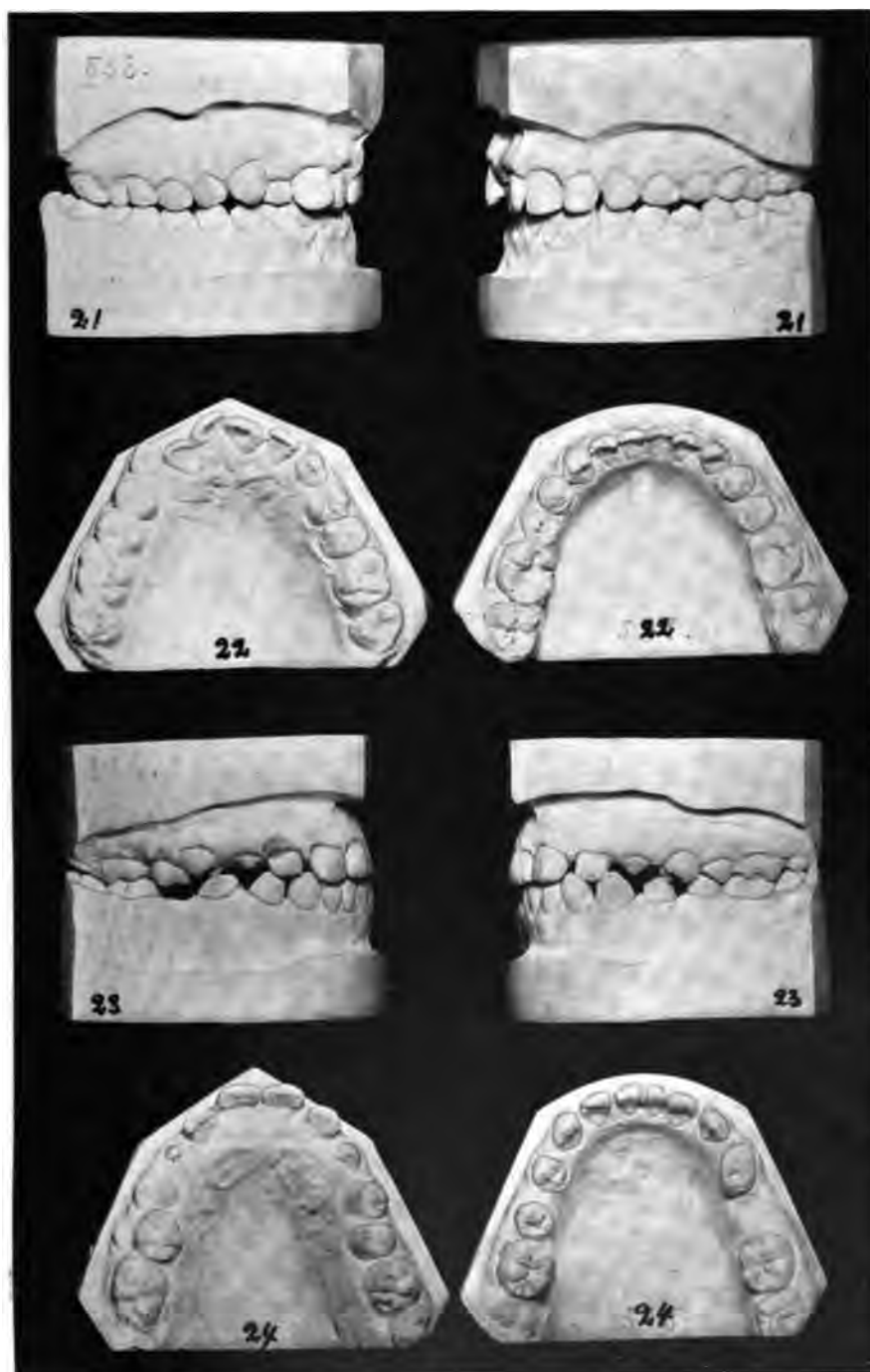
Figs. 9 to 12



Figs. 13 to 16



Figs. 17 to 20



Figs. 21 to 24



Figs. 25 to 28

Figs. 9 and 10. Girl eight years old—very small—had difficulty in walking. Admitted in 1917—jaw development good.

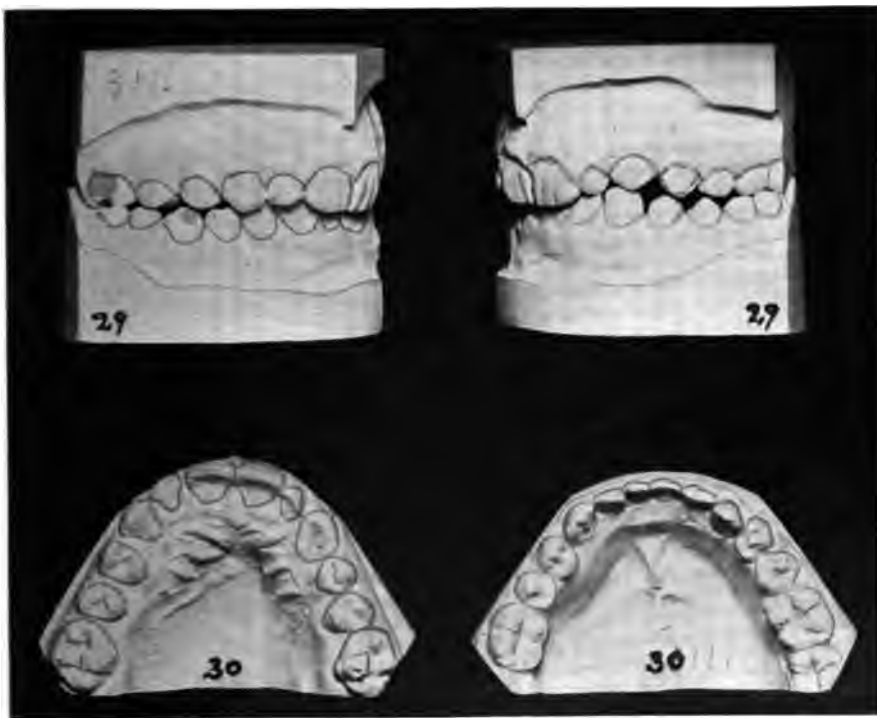
Figs. 11 and 12. Boy eight years old—arches well formed.

Figs. 13 and 14. Girl nine years old. Bad scoliosis—could not walk when admitted in 1913 and was in bed two years in the hospital.

Figs. 15 and 16. Boy ten years old, badly deformed back and legs. Teeth of first dentition mostly gone—no malocclusion resulting.

Figs. 17 and 18. Girl eleven years old. Admitted to hospital 1913. Upper incisors in lingual occlusion.

Figs. 19 and 20. Girl eleven years old. Admitted in 1916. Deformity of arms and legs, some crowding of the teeth and slight pitting of incisors.



Figs. 29 and 30.

Figs. 21 and 22. Boy twelve years old. Admitted in 1915. Nothing marked—slight irregularity of upper incisors.

Figs. 23 and 24. Girl twelve years old. Admitted in 1911. Very poorly nourished when admitted.

Figs. 25 and 26. Boy fourteen years old. Admitted in 1913. Bow-legs and other signs.

Figs. 27 and 28. Boy (colored) fifteen years old. Badly deformed back and bow-legs. The only case showing marked pitting; scarcely any enamel on any of the teeth.

Figs. 29 and 30. Girl fifteen years old, admitted in 1911. Case of bow-legs.

As no conclusions are to be drawn from the study of this one group of



rachitic children, a few speculative remarks may be permitted. The studies of the disease seem to show it to be essentially an epiphyseal disturbance of the bone, and an interesting question arises as to the existence or nonexistence of an epiphyseal cartilage in the mandibular joint.

Piersol<sup>3</sup> states (page 245): "The inferior maxilla has no epiphysis" and further says "as might therefore be expected, the ends of the bones at and near the articular surfaces are usually exempt from disease, in marked contrast to the long bones in which those regions especially suffer."

Alexander Low<sup>4</sup> (anatomy department University of Aberdeen) made a comprehensive study of practically complete series of many human embryos, and concluded that Meckel's cartilage does not enter into the formation of the lower jaw posterior to the incisor teeth, and that at a comparatively late stage in the development of the lower jaw (at the third month of fetal life) certain "accessory cartilaginous" nuclei appear in connection with the primary membrane bone. "There then is a well-defined, wedge-shaped condylar cartilage and a smaller coronoid cartilage. During the later fetal stage up to full term, the jaw rapidly becomes wholly converted into bone, all traces of the coronoid cartilage disappears, while remains of the condylar cartilage persists until birth. Further "accessory cartilages have no separate centers of ossification, but are replaced by undergoing regressive changes, being invaded by the surrounding membrane bone, destroyed by giant cells, and replaced by marrow tissue and trabeculae of bone."

This would seem to have a direct bearing on the question of orthodontic treatment in cases of traumatic injury or ankylosis of the joint after operation. Length growth in some bones depends on the integrity of the epiphyseal cartilage plate; but if growth in the mandible is not of an epiphyseal character, the prognosis in these cases would naturally be more favorable.

Regarding the softening of the bones, this may be said to be a characteristic of the disease. The form which the bone takes on as a result of rickets is not typical of the disease, but rather that it expresses the mechanical forces acting upon it. For example: The rachitic child is with difficulty induced to walk or play, but prefers to sit with crossed legs on the floor. In this position the mechanical bending force may deform the bone. A bend in the wrist is sometimes seen in the child who has been led about by its nurse for some time. The weight of the feet and legs projected beyond the edge of a chair is thought to give an anterior bowing of the legs. The mandible is a plastic structure in health, and under the stress of mastication preserves its form; hence in the softening of the bone and with uniform muscular weakness, no change in the bone necessarily occurs. In assuming that the pull of the masseter, for instance, deforms the bone in rickets, you infer that it is the rigidity that resists the pull in health, which is contrary to the physiologic nature of bone. If the bone would be deformed as the result of the softening which is characteristic of rickets, then our conception of the normal formation of bone is at fault. We believe that the formation of bone expresses an equilibrium determined by function, that it is molded by the physical forces to which it is subjected, and the muscles acting upon it, and that to *change* the form of bone we must either apply artificial force or stimulus directly or indirectly through *changed* muscular action. We

have no evidence, so far as I know, that there exists any changed muscular action during mastication in a rachitic child during the acute stages when the bones may be softened. However, as the work on our etiologic problems in the different fields of investigation goes on, it becomes more and more evident that casual information and opinion must give way or be modified as more extensive qualitative analyses are made.

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## PREVENTIVE ORTHODONTIA\*

BY RAYMOND J. WENKER, D.D.S., M.D., B.Sc., MILWAUKEE, WIS.

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IN presenting this paper I wish to direct your attention to a large unorganized field of practice. Some phases of it have been practiced by the orthodontist for a great many years, while some he has overlooked or allowed to pass into the hands of the pediatricist, the eye, ear, nose and throat specialist, the general surgeon, the general dentist, etc.

### DEFINITION

Preventive orthodontia comprises that field of practice which has for its object the foreseeing and inhibiting so far as practical, all etiologic factors of dento-facial malrelations.

Preventive measures, when compared with corrective measures under like conditions, are of a greater benefit to mankind. The prevention of an affection insures a greater physiologic result than it is possible to attain by corrective means. The most successful preventive measures prevent the establishment of pathologic processes, foreseeing and interdicting all handicaps to the normal physiologic growth.

Prevention in everyday practice is only occasionally so perfect as to anticipate and prevent all conditions, but more commonly it consists in recognizing and removing existing handicaps. The removal of these handicaps virtually amounts to making many minor corrections to prevent the later necessity of greater corrections. The necessity of these corrections should decrease as preventive treatment becomes more universally and effectively practiced.

The orthodontist has in a large measure neglected the most important part of preventive orthodontia, namely, the early stages of growth when most of the etiologic factors begin.

### EDUCATIONAL PROPAGANDA

It is indeed difficult to decide how early this field of practice may begin. Perhaps a good point to begin with would be with the prospective mother in the form of an educational propaganda. I do not wish to discuss in detail what this propaganda should consist of, but in general, it should include a consideration of the physical, mental and moral requirements for the mother to acquire and maintain her health and the health of her child. Every mother should be informed how to live to bring a healthy child into the world. She should know that no greater honor and privilege can be bestowed on her than that of giving birth to a healthy child. And to this end she should be taught sane, hygienic, and rational methods of living that she may substitute them for her superstitions and fallacious ideas.

This phase of the subject overlaps that of the pediatricist's, but I can see no good reason why this propaganda should not be a combined movement including all parties interested and qualified to join in the undertaking.

\*Read before the Nineteenth Annual Meeting of the American Society of Orthodontists, St. Louis, Mo., March 10, 11, 12, 1919.

## ETIOLOGIC FACTORS

One of the earliest active factors which influences growth is that of infection of the mother occurring prior to, or during pregnancy. The most important of these is probably that of syphilis.

## SYPHILIS

If a fetus becomes infected with syphilis it may die and be aborted. If perchance the syphilitic mother should develop a degree of immunity against the *Treponema pallidum* the next pregnancy may result in the birth of a living child. Or, if by reason of antisyphilitic treatment of the mother the infection is reduced, the future pregnancies offer more encouragement. The recognition and treatment of this infection is indicated. The physician in charge will be the one called upon and whose duty it will be to diagnose and treat, not only the child, but the father and mother as well. The infection, however, may be so mild as to be overlooked.

Evidences of syphilis may frequently be recognized by the orthodontist in early childhood. The manifestations common in the newborn are coryza, mucous patches and skin eruptions. When these heal they leave scars, especially at the angles of the mouth and nose. Other manifestations later in life may be affected—sight, hearing, gummata in various parts of the mouth, Hutchinson's teeth, etc. Tardy eruption and extensive caries are also conspicuous in this affection.

## CONGENITAL DEFECTS

Congenital defects, namely, harelip and cleft palate, are important affections interfering with normal jaw development and should receive early treatment. These children are frequently weak and delicate and require the care of the skilled oral surgeon. Treatment of these cases may be regarded as preventive measures in the field of orthodontia.

## ACUTE INFECTIOUS DISEASES

The acute infectious diseases of childhood are important causative factors in the development of dento-facial malrelations. These affections are of interest to the orthodontist from the point of view that they cause, favor, or produce, hyperplasia of the lymphoid tissue of the nasopharynx and also cause a general perversion of metabolism and thus influence the growth of the child. Every general metabolic disturbance has a corresponding influence in jaw development, especially during the early stages of growth. The usual treatment is indicated in these affections.

## GLANDS OF INTERNAL SECRETION

Federspiel has suggested that pituitary disturbances may have a bearing on jaw development to a greater extent than we have heretofore recognized.

There are two types of pituitary disturbances which may occur in childhood. The one is hyperpituitarism which produces excessive growth and the other is hypopituitarism which has the opposite effect resembling cretinism. In disturbances of the thyroid gland there is but one type which is of interest to the orthodontist and that is a hypothyroidism known as cretinism.

All bone dystrophies due to disturbances of the endocrine glands should receive organotherapy and other rational treatment according to indications.

#### NUTRITION

It has been evident for many years that the nutrition of the child in the first months of life is of great importance in relation to future growth. It appears that a given handicap to normal metabolism is more harmful in proportion as it occurs earlier in its life.

#### DIETARY CONSIDERATIONS

Dietary considerations are therefore the next in order, and although the physician in charge usually attends to this requirement, still the orthodontist should be familiar with this subject that he may intelligently discuss it with the parents or physician in its relation to jaw development.

Williams, an authority on obstetrics, has submitted evidence of the infrequency of normal nursing of infants. He makes the statement that less than 25 per cent of the mothers of New York State are able to nurse their children and that that number is decreasing. Hellman contends that arrested development of the jaws is more prevalent among artificially fed infants than among the breast fed. He has estimated that 81 per cent of arrested jaw development may be found in the artificial class. In the author's study of 643 children he has found 508 cases of maldevelopment of the jaws in the artificial class or a trifle over 79 per cent. That there is a large percentage of arrested development among this class is very evident to the observing orthodontist. This may be accounted for in the different proportion of the ingredients and digestible quality of cow's milk and other substitutes as compared with human milk.

Another interesting and valuable point in connection with artificial feeding is the greater susceptibility to infection among these children than those of the breast fed class. This may be accounted for in the prevalence of defective metabolism as well as the absence of the immunity imparted by human milk. The adenoid type is therefore more prevalent also in this class.

There are two preventive measures which suggest themselves to me which should be resorted to by the mother not able or apparently unable to nurse her children. The first choice is to encourage her organism to secrete milk by means of diet, exercise and massage, and the other is the old practice of employing a good wet nurse. Both of these methods have proved very successful.

If, however, artificial feeding must be resorted to, there are two important points to determine: first, the digestive capacity, and second, the caloric requirement of the infant. The former should not be overtaxed in the effort to bring the quality and quantity of the food up to the caloric requirement. To this end the entire dependence on any single or a combination of proprietary foods is contraindicated because of the large carbohydrate content and the deficiency of fat and protein which they usually contain.

#### RACHITIS

In my estimation, rachitis is one of the most important dietary disturbances in the entire list. I believe it is a much more active causative factor than it is generally conceded to be. Heretofore, we have only recognized it in its most pronounced form. As a matter of fact, there are a great variety of minor manifestations, and particularly that of arrested jaw development which have in a

large measure been overlooked. Lischer has called our attention to maldevelopment of the mandible resulting from rickets. Holt and Fischer have also mentioned it as a factor, but in a rather general way. In my studies and clinical observation it appears that in every case of rachitis with all of the gross classical symptoms there is usually a marked jaw deformity, equally as pronounced as the case illustrated by Lischer. There is also a large percentage of cases with minor general bone involvement which manifest comparatively mild forms of jaw deformities. Dewey has called our attention to the early shedding of deciduous teeth and tardy eruption of the permanent teeth in rachitic children. The absence of mechanical stimulus to the jaws supplied by erupted deciduous teeth from the shedding until the eruption of the permanent teeth must have a detrimental effect on their growth. Noyes has discussed this mechanical stimulus imparted to the growing jaws by the presence of the teeth. There is also manifested in rickets a tardy eruption of the deciduous teeth which frequently causes much difficulty, such as inflammation, pain and suppuration. The artificially fed class, however, does not supply all of the cases of rickets. Among the Italian and Ethiopian races a large number has been observed in the breast fed class by Hess. In his experiments with these cases, he has used cod liver oil with success as a corrective and preventive measure. For further information on this subject I would refer you to these authors.

Parents should be made to realize the full value of the services of the orthodontist from birth to early adult life to aid in the prevention of jaw deformities. His counsel in conjunction with the physician in charge should be of real value, provided, of course, that the orthodontist equips himself with the necessary knowledge to make his services valuable. He should be well informed on all questions pertaining to infant metabolism. He should be especially prepared to explain all phases of jaw development and tooth eruption and to take care of delayed and abnormal eruption. All dietary errors and pernicious habits should be detected early and steps taken for their correction. The child should be encouraged to use its teeth as soon as they erupt. To this end it should be encouraged to chew crusts of bread and other hard material, not for the food value, but for the exercise it may get in the effort. I believe strongly in the value of mouth gymnastics, beginning as early as possible and continuing during the entire growing period. Much credit is due to Rogers for his valuable discussion of muscular exercise in corrective orthodontia. It is likewise very valuable in preventive orthodontia. The stimulating influence to the circulation and digestion, and therefore, to normal metabolism imparted by this method, is very helpful. If, however, the supply of food material is deficient in quality, no amount of exercise will serve as a substitute for good food. Converting them into play has proved quite successful, especially in the hands of a clever mother. Another method is to reward the child for carrying out the exercises. As the child progresses in development it is, of course, understood that its teeth should receive regular prophylactic treatment. In fact, the entire mouth, as well as the nose and throat, should be kept in good health, during the growing period.

#### ADENOIDS AND TONSILS

A very important branch of preventive orthodontia, namely, the diagnosis and treatment of adenoids and troublesome tonsils has been largely neglected

by the orthodontist. If preventive measures are to be practiced in part, may I ask the question, why should not all preventive treatment be included? If the orthodontist is not prepared to do so, has he made ample preparation to practice his specialty? I contend that he should be prepared to practice all reasonable and legitimate phases of it.

Bogue, of New York, has called our attention to the frequency of arrested development of the jaws in early childhood. He maintains that the deciduous teeth should show a definite spacing between the ages of two and six. In other words, Nature should anticipate and get ready for the eruption and alignment of the larger set of teeth which she is growing in the deeper structures. This spacing should become manifest as early as two or three years of age by the expansive growth of the jaws larger than is necessary to accommodate the deciduous teeth. When it is most pronounced it may be observed in all parts of the arch. The widest spacing usually appears in the anterior part of the arch.



Fig. 1.



Fig. 2.

Fig. 1.—R. M., age six, bottle-fed, adenoid and tonsil complication, lingual measurement of upper arch between the second deciduous molars is 24 mm. Permanent upper central incisors are erupted.

Fig. 2.—Same as Fig. 1, adenoids and tonsils removed.

In less marked cases it is evident between the anterior teeth only. Unfortunately, however, this spacing is absent or is evident only in slight degree in an extremely large percentage of the children of the present period. Bogue states that from .94 to .96 per cent of the children of the present period present evidences of arrested development of the jaws from two to six years of age. He has also called our attention to a normal minimum size of deciduous jaws. They should not measure less than twenty-eight millimeters in width between the lingual surfaces of the molars on one side to the same location across the arch. All jaws above this width manifest a definite spacing and all below show an absence of or deficient spacing. While we are disinclined to accept a definite measurement as indicative of the normal or abnormal, still a minimum measurement may serve the practical purpose of indicating, in the average case, the dividing line between the two classes.

The large percentage of arrested development of the deciduous jaws which Bogue has estimated, I presume, is calculated on this minimum basis. This percentage appears excessive, nevertheless, we are all agreed that there is a marked prevalence of arrested development in the present period.

Arrested development of the jaws is also to be observed in the adult. Abundant evidence of it is constantly before the mouth, nose and throat specialist. In an examination of the mouth, nose and throat of 2800 recruits for the United States Army, I have observed arrested development or deficient width of the jaws in fully 90 per cent. The cause of this condition was not ascertained but the great prevalence of it was carefully noted during this examination.

What relation there may be between the large percentage of bottle fed children, the large number of rachitic cases and the large percentage of arrested jaw development is impossible to correctly state. The 75 percentage of Williams, the 81 percentage of Hellman, the 78 and 90 percentage of the author, and the 94 percentage of Bogue are at least suggestive of a relationship.

These figures are, however, subject to modification by making a study of a still larger number of cases and by making due allowance for numerous other conditions. Racial, climatic, social and economic conditions have their influence and these have not received due consideration in a study sufficiently elaborate to make them final. We may, therefore, accept them as bearing only a tentative relationship.

#### TREATMENT

The treatment of these cases should consist of both preventive and corrective treatment. The question is: To what extent can these arrested and mal-developments be prevented? It is probable that much can be done by an educational propaganda among mothers as previously mentioned. This propaganda should, in the course of years, effect a large reduction in the number of these deformities.

#### CORRECTIVE TREATMENT

As soon as this arrested development can be diagnosed, namely, between the ages of two and six, if the health and stamina of the child will permit, expansion of the jaws may be undertaken. Unfortunately, a very large percentage of these children are unmanageable, because of an unstable nervous system and harmful teaching. Much depends on the stamina of the child and still more upon the skill of the orthodontist. If, however, a given child can not be managed, the only alternative is to postpone the treatment.

#### METHOD

The question of method may be briefly considered at this point. The Richardson plate or some modification of it seems the most feasible. The modification which appears practical to me for this purpose is a removable basket, some type of lingual arch, or the new Jackson appliance secured by means of bands cemented to the teeth provided with lugs or tubes by means of which to automatically lock the appliance in place. This may be so made that the child can not remove it, but the operator can.

#### PREDETERMINATION OF PERMANENT ARCH

The next step is the predetermination of the permanent arch in order to serve as a guide in the expansion of the deciduous arch. This method, however, which I am about to describe, is not intended as a scientific correlation, but rather as a suggestion based on esthetic correlation. If expansion is under-



taken before the eruption of the permanent anterior teeth, x-rays of the upper central, lateral and cuspid on one side may be taken to determine their total width.

Using this measurement as the radius, draw a circle with a pair of calipers to represent the curvature of the upper permanent arch from the distal surface of one cuspid to the distal of the other. Then enlarge the x-ray of the labial aspect of the central crown, by photographic means until the labio-gingival curvature corresponds in size to the arc of the circle. This enlarged photograph of the central is then cut out on a line corresponding with the gingival curvature and proximal sides. Place this cut photograph over the circle and its proximal sides furnish a continuation of the arch from the distal surface of each cuspid, distally. This completed arch line will serve as an approximate guide for the size and shape of the future permanent arch of a given individual.

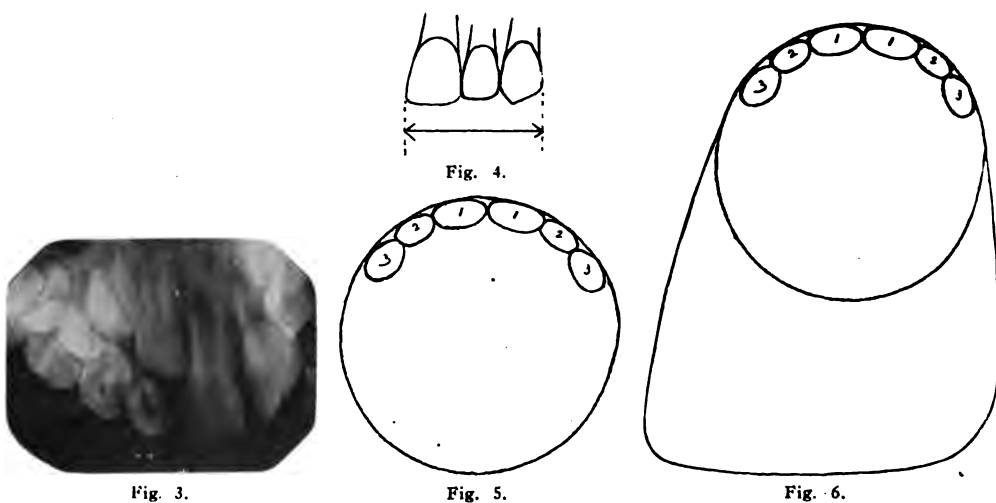


Fig. 3.—Radiogram taken to secure total width of central, lateral, and cuspid in the predetermination of the normal permanent arch.

Fig. 4.—Teeth aligned to obtain total width for radius of circle.

Fig. 5.—Circle whose radius is equal to the total width of the central, lateral, and cuspid, and the six anterior teeth of correct size sketched therein.

Fig. 6.—Labial outline of central enlarged to correspond at gingival end to circle in Fig. 5, and placed over the circle. Mesial and distal lines represent the approximal size and shape of normal arch in the bicuspid and molar region.

#### RETENTION

The length of time necessary to retain a deciduous arch after expanding will vary according to whether the patient is giving active cooperation in muscular exercises, according to age, the type of case and according to whether the arches have been overexpanded to allow for a certain amount of reaction of the tissues in contracting after removal of the appliance.

#### CONCLUSIONS

An educational propaganda on preventive orthodontia, including preventive pediatrics should be organized on a large scale and should be composed of interested and qualified members among the laity as well as the professions.

This organization should become a part of the general social service movement for better babies.

No field of educational activity can be of greater benefit to humanity than this.

A child with a defective initial growth is handicapped throughout life.

That the enormous prevalence of maldevelopment may be materially reduced there can be no question.

That this prevalence is largely due to artificial feeding appears evident.

The hazard to jaw development by artificial feeding is not generally recognized, neither by the laity nor the medical profession. Artificial feeding should be freely and persistently discouraged and the danger of it impressed on mothers.

The orthodontist should become a valuable consultant and coworker with the physician in pediatrics. This should begin with early infancy in preference to the custom of waiting until a deformity is recognized.

## DISCUSSION ON THE PAPERS OF DRS. WENKER AND HATFIELD

*Dr. M. N. Federspiel, Milwaukee, Wisconsin.*—Dr. Wenker in his paper has covered the subject so completely that it is impossible to discuss it unless one disagrees with some of the views he has expressed.

With reference to the subject of diet, I will endeavor to point out to you what happens in animals when we have dietetic errors. In Wisconsin a farmer had some young pigs that were born without hair. This happened repeatedly, and he sustained quite a loss from a financial standpoint. He appealed to the Agricultural Department of the University of Wisconsin to find out the cause. They investigated it and tried to find the causative factor of why these young pigs were born without hair and were weaklings which died within a few days after birth. They added potassium iodide to the food at different periods while the sow was pregnant. A number of pigs were born that were perfectly healthy and lively and had plenty of hair.

The Department of Agriculture and Animal Industry of the University of Wisconsin undertook another investigation. They found that many of the calves of different farmers were born rickety, with large heads and had pot bellies and were not able to stand several hours after they were born. They found that the constant feeding of these cattle with roughage and wheat bran was the contributory cause as to why these young calves were born in that condition and were considered weaklings. By giving them a variety of foods and plenty of roughage they were able to produce calves that were perfectly healthy.

Now if this is true of young animal life, it can be proved as regards the human being.

It seems to me, we are living in an age in which we are not eating enough roughage; we are eating a lot of sloppy cereals and predigested foods and the offspring are either eliminated or get a rather poor start. So much for diet.

Speaking of syphilis, rickets and various other pathologic phenomena that enter into malformations of the jaw, does it not seem strange that some children of syphilitics have perfectly normal teeth, and yet they have the syphilitic manifestations in other parts of the body, which goes to prove that syphilis is not a respecter of any special organ. It may affect the kidneys; it may affect the brain or the eye; or it may affect the teeth. The child may have an iritis from a specific cause, although it may have a normal denture.

Dr. Hatfield showed us the slide of a patient who had been five years in the hospital suffering from rickets. I would call the mouth fairly normal in that case.

## HISTORY OF ORTHODONTIA

(Continued from page 247, Vol. V)

BY BERNHARD WOLF WEINBERGER, D.D.S., NEW YORK CITY

W. STORER HOW describes in the *Dental Cosmos*, 1887, page 479, his  
• *Appliances for Regulating Teeth*:

"The fundamental feature of the principal contrivance is a piece of thin platinum wire .030 in diameter, an inch and a half long, and threaded to the distance of four-tenths (.4) of an inch from each end. This is bent in the form of a double curved bow, Fig. 1, the arms of which are separated to the width of an average sized molar at its neck. A gold coupling plate, Fig. 2, is so constructed that the bow-ends will pass through it and receive the nuts. All these parts are shown assembled in Fig. 3 to constitute a molar yoke. A shorter piece of wire is also bent to form a bicuspid bow, and a suitable coupling-plate, is in like manner associated with this bow to form a bicuspid yoke, which is furthermore capable of adjustment on any of the oral teeth. The molar yoke is shown in position on an inferior left first molar, Fig. 4, and this result is easily accomplished by first pushing the threaded ends of the molar bow from the lingual side close to the gum between the molars, and between the molar and bicuspid, until the bow-ends project considerably from the buccal side of the molar. The



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.

coupling plate is then put over the bow-ends and the nuts turned on by means of the lever nut wrench, in the hollow end of which a nut is first put and held by friction while being carried to and started on one of the bow-ends. In some positions it may be necessary to place the nut in the wrench-end of the lever in order to start the nut on the bow. The manner of attaching the bicuspid yoke is in all respects similar to that of the molar yoke, and, by means of the clips observable on the coupling plates, a limit is set to the tendency of the plates under the clamping action of the nuts to impinge upon the gingival margins. These clips are easily bent with pliers to adjust the limit on varying lengths of teeth-crowns, so that in no instance need there be any encroachment of the wire upon the pericementum or the festoons of the gums, for, in the event of an unusually close approximation of the teeth, the wire may be made thinner with a file fine enough not to leave a rough bur on the cut-away threads of the opposite sides of the filed wire. In some instances it may be best to have the two sides incline towards each other, so that a cross section of the threaded portions of the wire would exhibit a rounded V-shape which, with the base of the V placed next the gum, would permit the passage of the wire without any interference with the gums. In fact, the chief excellence of this contrivance consists in the facility it

affords for immediately and firmly fixing a yoke upon any tooth, of any shape, and in almost any position in the mouth. If the inner surface of a tooth at its cervix shall slope so that the bow will tend too strongly towards the gum, then a limiting clip of gold plate may be soldered to the wire. This piece will also serve for the attachment of a ligature for moving that tooth, or others. For such moving purposes, however, it is better to solder on the wire a button, on which the ligature may be tied, or over which a rubber band may be caught, or from which these may easily be detached without disturbance of the yoke. The yokes are preferably so formed that the ends of a regulating bow-spring—like that of Dr. Patrick—will slide within them, and be clamped therein by the action of the nuts, which at the same time draw the yokes on the teeth. Thus the bow-spring may be quickly inserted, adjusted, and fixed in any desired position. Fig. 5 shows one anchored to a molar and a bicuspid."

In the *Dental Cosmos*, 1891, pages 114 and 198, we find another article by *How* under *Teeth Regulating Appliances and Related Devices of Thirty Odd Years Ago*. *How* states:



Fig. 5.

"Historically considered, many most useful contrivances will be found to have been reinvented from time to time until the successive periods have become so numerous that the names of the first originators are discovered only by painstaking research among remaining records, if, indeed, the earliest publication should no longer be accessible. A further element of uncertainty is the frequent obscurity and incompleteness of the descriptive terms in which the forms and arrangements of material structures were sought to be set forth; whereas an illustration, even if rudely drawn, would convey a clearer idea of the several parts of an operative device than many words, however skillfully chosen.

"Pictorial representation is now largely relied upon to impart correct notions of the character of constructions in every useful form, and this is particularly true of appliances for the correction of irregularities of the teeth. Some of these as shown in modern publications have features familiar to dentists of long experience, yet the mere recounting of such personal recollections might not be deemed conclusive to an ordinarily skeptical mind, and it was therefore with some degree of individual interest that in a recent rearward glance over the files of some dental journals there were discovered illustrations, some of which are

appended, printed from electrotypes taken from the original wood cuts without the slightest change or alteration in any of them."

After describing a great number of appliances by men well known to the profession How states (page 202):

"Many other well-known old devices described without illustration might with advantage to the profession be given pictorial embodiment as in the preceding new cuts, but these old cuts in their unquestionably clear anticipation of later devices relating to dental regulation, crown and bridgework, will certainly prove serviceable, and are respectfully submitted to whom it may concern.

"The devices which follow are some old and some new, but all embody the ancient principle of a spring-push or pull on the tooth or teeth to be moved. A simple form of finger-spring is made by first cutting a pattern from thin rolled block-tin and fitting it to a plaster cast of the teeth, although in some instances I have fitted it over the teeth in the mouth. From a piece of spring gold plate the regulator is then cut, closely following the pattern. In some instances it is desirable to get a close conforming fit by striking it on a metal die made from the cast. It is obvious from Fig. 6 that successive bendings of the spring finger will soon bring into line and place the errant cuspid, and as during and after the

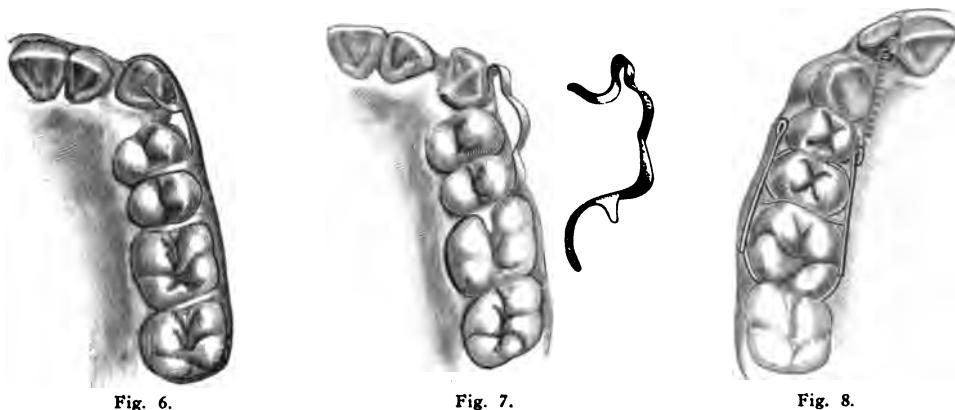


Fig. 6.

Fig. 7.

Fig. 8.

moving of the tooth regulator may be readily sprung off and on by the patient for cleansing purposes, it is also the fact that it serves as a retaining device which can be worn for any prescribed length of time.

"A forthpushing finger-spring of like character is illustrated by Fig. 7, both detached and in action after several days' use.

"A crib and collar with a pulling spiral spring is shown by Fig. 8.

"A spring-jack for push or pull action is readily made from suitable half-round wire, or by filing to half-round shape two pieces of pretty thick wire, as shown in Fig. 9. A spiral coil of fine spring-wire will then serve as a socket for the two half-round wires, and by simply touching the point of the soldering-iron to the ends of the spring they will be soldered to the thick wire, and the jack be ready for action. To increase the push power, it is only necessary to pull open the spring slightly. Attached to collars as shown in Fig. 9 (center) it will either push or pull as desired, adjustment of spring tension being easily effected by a touch of the soldering-iron; and as the springs are readily made, and kept at hand, a long or short spring can be quickly put in place. In Fig. 9 (bottom)

little sliding collars will enable adjustments of tension to be made while the fixture is in place. It will be observed by referring to Fig. 10 that when the two halves of the jack are inclosed within the spring, they are firmly prevented from rotation by the contact of their flattened sides, but they are free to slide forth and back as indicated by the arrows.

"In Fig. 10 the device is shown in action as a pushing-jack, and the peculiar adaptation of the neck-wires for simple security of impingement without disturbance of the gum-margins is apparent. For greater security ligatures are, of course, applicable, and can be added without difficulty.

"These spring-jacks can be made very small and short, and are therefore readily adaptable to clasps, and cribs, and plates of every kind; they can even be curved so as to act upon an arc of a circle."

A. E. Matteson in an article in the *Dental Cosmos*, 1888, page 68 entitled *A Regulating Device* introduced his method of compound coil and lever spring as follows:

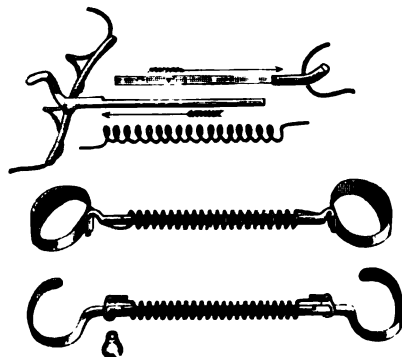


Fig. 9.



Fig. 10.

"In minor operations for the correction of dental irregularities, I have found very useful the compound coil and lever spring shown in Fig. 11. This is made of piano wire, No. 14 or 16, according to the degree of expansive power designed to be exerted by it. The diameters of the coils and the lengths of the levers are to be determined by the positions and relations of the teeth to be moved. So, too, the distance of the coils from each other will depend upon the circumstances of the case.

"Preferably the coils are to be made small and the levers short, in order that the device may lie close to the teeth upon which it is intended to act. A narrow ribbon is then made of gold or platina plate, as thin as No. 40, and of a length sufficient for its special purpose.

"In the case illustrated, the ribbon bends over the distal side of the central, passes behind the lateral, and comes out over the mesial side of the cuspid. The free ends of the spring levers are brought towards each other, and, by means of fine binding-wire or strong twine passing through their loops, are held against the expanding strain of the compressed coils (see Fig. 12). The bound spring is then to be laid over the ribbon ends as they rest on the central and cuspid, and the ribbon marked where the ends of the spring touch it. The ribbon is removed

and punched with a plate punch at the marked points, and also at other points near these and towards the middle of the ribbon, to provide for the taking up of the ribbon as its ends become separated by the distending action of the spring during the progress of the operation. The ribbon is again put in place on the teeth; the lever ends inserted in the punched holes, and the twine cut or the binding wire untwisted to bring the spring into operation."

In the *Dental Review*, 1892, page 563, *Matteson* explains his other method of treating irregularities:

"The appliance used is simple as you will see, and rather after that of Dr. Angle's system. After using and turning the screw, the teeth were brought forward, they had been worn so short it was necessary to elongate them. All that I did was to use the same appliance by bending the wire toward the cutting edge, the spring of it drew the teeth down.

"The first right molar and the first right bicuspid were banded. On the lingual side of the bicuspid was soldered a short tube. One end of screw-cut German silver (No. 20 gauge) was soldered to the band on the molar—the other end passing through the tube on the bicuspid band. (Fig. 13.)



Fig. 11.

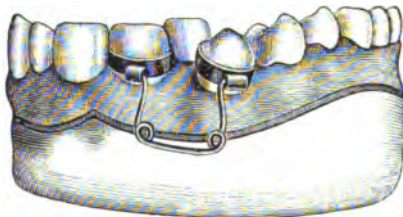


Fig. 12.



Fig. 13.

"On this wire screw between the bands, was placed first a nut then a T-tube, and in front of the T-tube and on the band of bicuspid another nut.

"The left central was banded with 'gold platina' plate with a lug on the lingual surface.

"The left second bicuspid was banded and a short tube on the buccal, and a long T-tube on the lingual surfaces, was soldered transversely.

"Schomacher gold-plated piano wire (No. 16 gauge) was formed, the ends passing into the openings of the T-tubes and in contact with the central incisor above the lugs.

"This piano wire was supplemented with another (No. 14) and united by winding with fine wire and soft solder. The free end of this wire (No. 14) forced out the lateral.

"The second bicuspid was rotated by changing the angle of the piano wire where it entered the tube of the left bicuspid.

"By turning the nut which is back of the loose T-tube forward the pressure was brought against the central and lateral. This also permitted the adjustment

of the expansion of the arch either in the region of the molar or bicuspid. The nut in front of the screw was used to draw the first bicuspid back.

"The tube on the buccal surface of the left bicuspid band was to lock, when in position with a pin.

"The long tube on the inside of this band was to support it with the contingency of cutting a thread on this end of the piano wire, and with a nut, form a jackscrew to assist in forcing the incisors, although the necessity for this did not arise. This piano wire which I have mentioned is superior to any which I have used. It might be improved by a heavier plating. It can be obtained larger than I have mentioned but I have found No. 16 sufficient to expand the arch of any case so far since commencing its use.

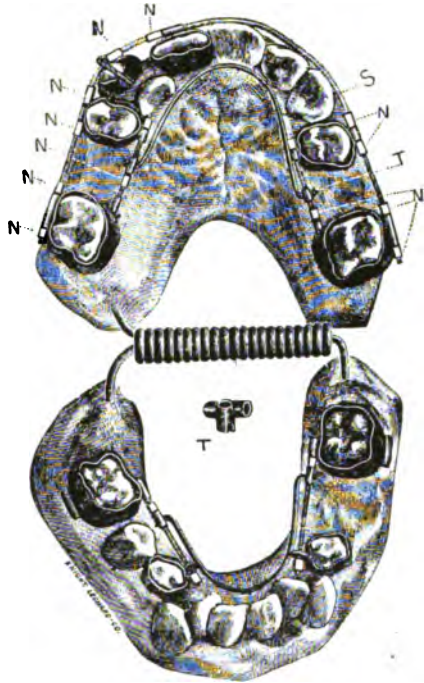


Fig. 14.

"In regard to making these nuts for irregularity cases, having found that cutting them out of solid nickel and German silver plate, to be drilled, tapped and squared, a very tedious process, I have simplified the method greatly by first drawing tubes of platinized silver (one part platinum and two parts silver), soldering the joint with 20 carat gold, then drawing through a 'square hole' draw plate, inserting piano wire in the tube, thus making a square tube with a round hole, then sawing off enough for a nut."

In discussing Dr. Jackson's paper before the World's Columbian Dental Congress, Matteson exhibited the appliance shown in Fig. 14, for expanding the dental arch:

"Fixed bands are constructed with such attachments as are required to carry the case forward to completion. On the upper model are the bands (cemented on the teeth), with tubes on the buccal and lingual surfaces. Around the labial



surface of the teeth extends a threaded gold wire (*S*) No. 22 B and S gauge, passing through and carrying nuts (*N*) in front and back of the tubes.

"The tubes on the lingual surface of the molars are tapped and receive a screw-cut rod which extends through the bicuspid tubes, with nuts (*N*) in front. On those bars are slipped T-tubes (*T*), and between each and the molar is a nut.

"The piano-wire spring is formed so as not to interfere with the occlusion and the comfort of the patient, and the ends bent at right angles, and passing into the cross tubes of the T. The nuts back of the T-tubes permit the adjustment of the action of the spring, either to the front or rear just where the force is required, and also may act as a jack-screw forcing out the inlocked lateral.

"On the end of the cross tube of the T-tube there is cut a slot or recess to receive the piano wire and lock it in position."

*Dental Review*, 1895, page 829. *Treatment of Irregularities of the Teeth with Cases.*

"The successful correction of this case was comparatively simple. The appliances were constructed of German silver as follows:

"Bands in the form of a figure eight were fitted to the first permanent and second deciduous molar on each side. To these bands on the buccal surface, and on the same horizontal plane, tubes were soldered. The lateral was banded, and on the lingual surface was soldered an open (wire) ring. Bands were fitted to the central incisors, embracing them as near the incisive edge; on the labial surface of each band was soldered a triangular shaped strip of plate  $\frac{1}{10}$  of an inch across at its base, and the other two sides  $\frac{5}{16}$  of an inch in length. To prevent the solder from flowing the whole width of the band a scale of mica was inserted. The points of these strips extended a trifle beyond the gingival margin. The mesial edges were placed parallel, for reasons to be explained later. A hard drawn wire (No. 20) was formed so as to extend around the labial surface of the teeth but not in contact with any but the central incisors at the gingival margins, the ends passing freely into the tubes on each side. The ends of this wire were threaded and nuts prepared for them.

"The place on the wire where the distal edges of the strips crossed it was marked, the wire removed and rings of smaller wire slipped to the marks and soft soldered without heating enough to draw the temper. After electro gilding, the bands were cemented to the teeth and allowed twenty-four hours to harden. The wire was inserted into the tubes and brought to place. A rubber ligature was looped over the wire, around and into the open ring back of the lateral.

"With pliers—one lip resting on the bases of the triangular strips and the other on their opposite points—the strips were curled over the wire. This was repeated two or three times a week, or as often as the soreness subsided.

"This shortening of the strips around the wire, which acted as a spring, forced the teeth into their sockets; while the wedge formed by the incline of the distal edges of the strips against the rings on the wire brought the mesial surfaces of the centrals together.

"After the incising edges of the teeth had been brought to their proper

alignment, the nuts were moved forward on the ends of the wire until the centrals were forced back into occlusion with the lower teeth.

"The same principle may be used to advantage in cases of retarded eruption not determined until later in life, by reversing the position of the triangular strip on the band against the wire, producing reverse action; or it may be used conjointly when one tooth requires subtruding and the other extruding, in which case reciprocating force is made available."

Other appliances as devised by Matteson are shown in Figs. 15 to 23.

*S. J. Shaw, Cosmos, 1888, pages 211 and 215. Shaw's first description of Regulating Studs is as follows:*



Fig. 15

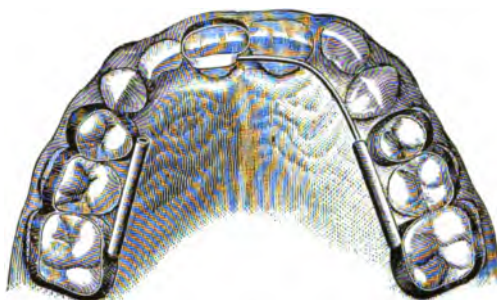


Fig. 17.

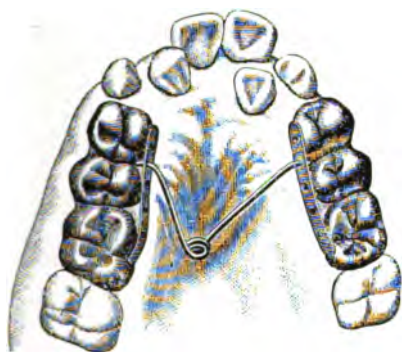


Fig. 16.

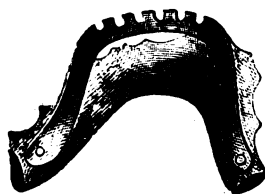


Fig. 18.

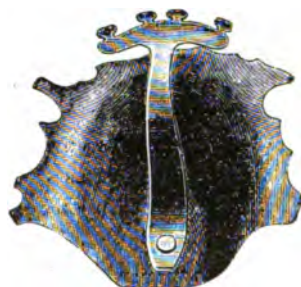


Fig. 19.

"Vulcanite and other fixtures for regulating teeth often require the attachment or insertion of studs or hooks, from which rubber rings may be stretched on to the teeth that are to be put into place. I have made such studs of celloid or hard rubber in form like that shown in Fig. 24, drilled and tapped through its center as shown in the section, Fig. 25. This stud I readily fix on the plate or bar by means of the screw, and a section through the stud, screw, and plate (see Fig. 26) makes evident the security of the attachment. In Fig. 27 is seen a plate in place, and a rubber ring stretched from the stud to the lateral, which is being pulled into position. The size of the stud-shank is such that the ligature will not be cut by the strain, and the stud-head is round and smooth, and overlaps the ligature, so that the tongue will neither be chafed nor interfered with to any appreciable degree during the progress of the regulating operation."

Under *Teeth Regulators*, page 215, *Shaw* then explains his method:

"For drawing outward an erratic incisor, a cross-bar, a screw with nut, and a loop or band form an effective combination. In application, however, the bar is apt to turn from the horizontal line, and to prevent this I solder to a face-

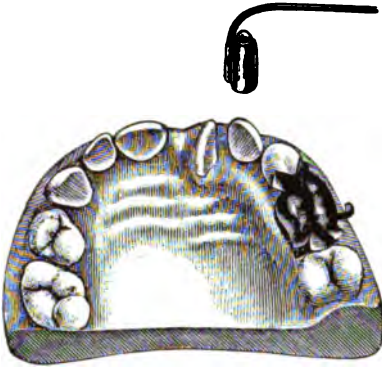


Fig. 20.

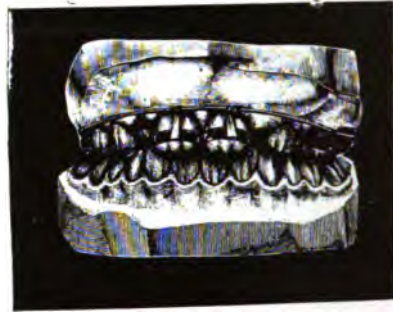


Fig. 22.



Fig. 21.



Fig. 23.



Fig. 24.



Fig. 25.



Fig. 26.

plate the screw and a parallel guide-pin (see Fig. 28), which with the screw passes through the bar and keeps it at right angles to the face-plate. This plate I attach to the tooth with waxed floss silk, and the fixture is thus made to serve for every such case that may be presented. For a retaining fixture, I simply solder a bar to a face-plate and tie it on with floss silk.

"The regulation of complicated cases I accomplish by a system of pivoted levers operated by jack-screws. In Fig. 29 it will be seen that the lower bicuspid must be moved outward before the cuspids can be brought in. For that purpose I made a vulcanite plate fitting over the bicuspid and molars. With a narrow,

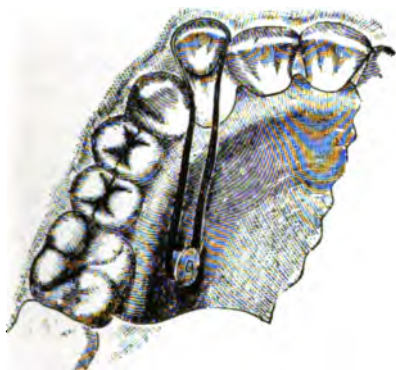


Fig. 27.



Fig. 30.



Fig. 28.

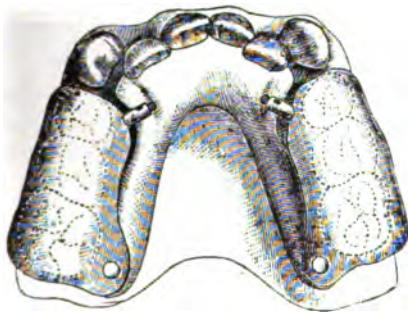


Fig. 29.

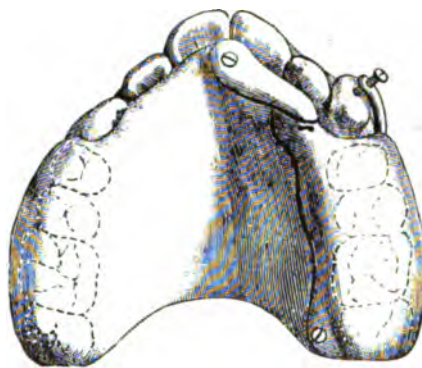


Fig. 31.

fine saw I cut sections from the plate of forms such as I could pivot at points behind the molars, and insert two jack-screws opposite the first bicuspid. The illustration shows the completed contrivance in position.

"In another instance, in which for improved occlusion it was desirable to push outward the left superior bicuspid, the pivot was placed opposite the cuspids, and a metal screw-arm built into the plate opposite the molar (Fig. 30). It is apparent that successive turnings of the screw would swing the lever outward and carry the bicuspid into place.

"Fig. 31 exhibits a case in which the superior left central incisor requires partial rotation, the lateral and both bicuspid an outward displacement, and the cuspid to be pushed inward. All these movements can be simultaneously effected by the compound pivoted levers and screw-arm shown. The illustration makes clear the details of the construction and operation of the device, which so directs and adjusts the mechanical powers brought into action that the turning of the screw against the neck of the cuspid will result in pushing it, and bringing the four other teeth into symmetrical alignment at one and the same time.

"It will be understood that in all the cases here illustrated casts showing the restoration of the teeth to their normal relations and positions have been at hand, but the cost of the cuts would be a great addition to the already expensive illustrations, and, therefore, as not really necessary to a complete comprehension of the operations, those casts have not been herein represented.

"I have other exemplifications of both the simple and compound lever appliances in models on casts of the cases in which they were employed, but the specimens given are deemed sufficient for the purpose of bringing the devices fairly before the profession."

*(To be continued)*

# DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

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## SOME PATHOLOGIC CONDITIONS OF THE MOUTH AND THEIR TREATMENT\*

BY CHALMERS J. LYONS, D.D.Sc., ANN ARBOR, MICH.

THE subject which your committee has asked me to talk on tonight is one of tremendous proportions. It is one that has been given too little attention in the past by the general practitioner. It is a lamentable fact that in the examination of the mouth, as made by the average dentists, the discovery of carious teeth is uppermost in the dentist's mind and his examination is completed when the tooth surfaces have been explored. The thought of making an examination of the mucous membrane, tongue, tonsils, pharynx, salivary glands, etc., is not usually considered. Blair, in his text book on *Surgery of the Mouth and Jaws*, says "until the much desired cancer specific is discovered, it is mainly to the educated dentist grounded in general oral pathology, who makes a complete survey of the whole mouth that the medical profession and the public must look to reduce the now increasing death rate from cancer of the mouth."

I wish then to call to your attention some of the pathologic conditions of the mouth and their treatment and to emphasize the great responsibility that the educated dentist must assume in his respective community.

Making a judicial dental diagnosis is not always a simple procedure and very often the skill and ingenuity of the operator is taxed to the utmost in working out the chain of evidence upon which he must base his decision.

A clear understanding by the dentist of the value of symptoms of disease he sees and of those described by the patient is of vital importance in making up this chain of evidence. One of the advantages of the dentist with long experience over the younger men is the ability of the older man to grasp the essential details of the condition at once. Much of this ability is gained by a gradual process through years of practice and observation.

It is true that in recent years the x-ray has aided us materially in our diag-

\*Read before the Minneapolis District Dental Society, Minneapolis, Minn.



nostic work around the mouth, yet too many men in our profession are depending entirely upon the radiogram in making a diagnosis. While we concede that the radiogram is indispensable in dental practice today, yet it should form only one link in the whole chain of evidence in formulating the diagnosis.

The history of present and past illness, signs and symptoms are very important in determining the diagnosis. It has been the observation of the writer that the best diagnosticians in both medicine and dentistry today are those men who have been trained to objectively and subjectively differentiate the pathologic from the physiologic and use the x-ray only as a further means of arriving at a definite conclusion.

Do not misinterpret the meaning here. The use of the x-ray must not be depreciated. Yet the plea which is made is that we must not overlook the fact that the radiogram is not the picture of the pathology, but only a record of the shadow of the tissues and the extent of the pathologic involvement which appears upon the film will depend largely upon the angle from which the radiogram was taken. This, you will readily agree, is not sufficiently definite to wholly rely upon in forming a judicious and conservative diagnosis.

#### PAIN

One of the most perplexing problems that confronts the general practitioner is obscure pain localized in the jaws. These pains are frequently referred from some lesion distant from the point of manifestation. Many times healthy teeth are sacrificed in the endeavor to eliminate the possible source of so-called neuralgia, when the source of irritation is remote from the seat of pain, but misinterpreted by the patient. Goldschider has put forth a theory that in the Gasserian ganglion there are certain nerve cells performing a dual role. These cells have either split fibers or two separate nerve fibers, one running in one division of the fifth nerve and the other in one of the other divisions of the same nerve; thus pain may be manifested in the region of an upper cuspid or incisor tooth when the source of irritation is in a lower molar. A short time ago the writer had a case of pain in an upper cuspid tooth when the source of irritation was found to be in a para-tonsillar abscess, or on a branch of the lingual nerve and referred to the upper cuspid on a branch of the maxillary nerve. It is not at all an uncommon occurrence to find referred pain from impact or unerupted third molars. How frequently do we find headaches relieved after the removal of impacted teeth? The practical lesson to be derived from this is that the dentist should be on his guard against a number of sources of error in diagnosis of pain and that these cases demand of the dentist a most thorough knowledge of the anatomy of the field in which he labors. A slight derangement of nervous function may produce the most unexpected consequences in the most unexpected places.

With our present methods of nerve blocking, if the source of irritation is in either the second or third divisions of the fifth nerve, a definite diagnosis can usually be made by blocking off a section of each branch at a time and observing results.

In cases of severe tic douloureux, many times the teeth are sacrificed needlessly by the dentist in the endeavor to give the patient relief. This practice is so conspicuous that a very large majority of the patients that we see in the hos-

pitals of the University of Michigan who have suffered with tic for any length of time, have edentulous jaws. This is a practice that is not at all justifiable. Our knowledge of dental and oral pathology should be of such a high order that no tooth in the head should be sacrificed unless we are reasonably sure that the patient is going to be benefited.

Hutchinson—London Lancet 1918, says: "The extraction of teeth with a view of relieving or curing true epileptiform neuralgia or tic douloureux is a pernicious and useless practice." There exists no valid evidence to regard trigeminal neuralgia as a spreading neuritis of dental origin.

It is contended by many able-brained surgeons that the etiology of tic douloureux is of central origin and the elimination of the teeth would in no way be of any assistance in the relief to the patient.

Our experience in the past has been that alcoholic injections or even neurectomy for tic douloureux is of little more value than extraction of the teeth in offering permanent relief. It is the writer's opinion that operation on the ganglion itself, though attended with all of its dangerous sequela, is the only means of permanently relieving the patient.

Another type of referred pain in the inferior maxilla that is often perplexing to the general practitioner is that arising from an old syphilitic lesion. This is a referred pain from syphilis of the heart or aorta and is probably referred through the sympathetic system. It is not an uncommon condition and must be taken into consideration in running down these obscure pains. Such conditions improve under antisyphilitic treatment.

In my opinion, syphilis is a greater curse to mankind than tuberculosis. There is probably no other disease that is as insidious in its progress with as far reaching effects as this disease. At the present time our one bright hope in the control of this disease is in the army and in segregation of those afflicted. Syphilis is due to the infection with *Spirocheta pallida* and is only transmitted by contact. Consequently, it can only be controlled by segregation. A favorite site for the primary lesion or hard chancre is on the lip; it is also frequently found situated on the tonsils. The primary lesion is seldom found on the cheek or tongue.

In its incipient stage, it appears as a crack in the lip or an abrasion, surrounded by a thickening of the tissues, which is later destroyed by ulceration. This can be differentiated from certain forms of stomatitis in that the chancre is painless and usually causes enlargement of the lymph nodes.

Secondary syphilitic manifestations of the mouth are usually of an erythematous or ulcerative type, commonly seen on the oral pharynx as an inflammatory area, attended by little or no pain. The mucous patch may be observed on the edge and tip of the tongue, and on the dorsum of the tongue, uvula and fauces. These mucous patches frequently are found on the inner surface of the lips. They appear as large or small, either round or irregular plaques of a grayish white color covered by a sticky secretion.

These can be differentiated from the plaques of leucoplakia buccalis in that those from the latter can be traced as arising from a local irritation. Secondary manifestations of syphilis in the mouth may be differentiated from certain forms of stomatitis, Vincent's angina or other acute mouth lesions, in that the syphilitic lesions are not accompanied by much pain.



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Tertiary syphilitic manifestations are frequently seen in the mouth as gummatous ulcers. These may be mistaken for carcinomata if on the cheek or tongue. On the tongue it will usually appear over the whole upper surface while carcinomata would be confined only on the edge and involve only one side of the tongue. Carcinoma of the mouth is frequently the site of an old syphilitic lesion. Jonathan Hutchins, Jr., informs us that in 30 per cent of patients suffering from epithelioma of the tongue, a history of former syphilis can be obtained; 20 per cent of epitheliomata of the tongue have their site on syphilitic inflammation.

Diagnosis of syphilis from mouth lesions is not at all a simple matter. The history of the patient is usually not reliable, for in the large majority of patients the knowledge of the presence of venereal disease is denied. The Wassermann test is the most reliable one at our disposal today. While all syphilitics will not give a positive reaction, yet it is very rare that a positive reaction can not be obtained in the presence of active syphilis.

What is the dentist's responsibility relative to the syphilis? When this disease is so prevalent as it is today, when its sequelæ are not so far reaching, when it is so easily transmitted to others, is it sufficient for us when examining mouths of patients to simply look for carious teeth? There can be but one answer to this question.

A few weeks ago a bright, fine looking Miss of 15 presented herself for mouth examination. When she opened her mouth, I was amazed to find that the whole palatal vault was missing, together with central, cuspid, bicuspid, and one molar tooth on each side. The condition was at once recognized as syphilis. In so healthy appearing an individual, the presence of congenital syphilis was dismissed. In obtaining the history, this syphilitic condition was found to have been induced by vaccination about four years previous. The only answer for the presence of this condition is that unclean instruments were used at the time of vaccination. This same unfortunate result might easily occur from unclean dental instruments after operating on a syphilitic. Today you say we all sterilize our instruments. Yes, but how about the hands? Do we use rubber gloves on these suspected cases and how about those cases we operate on that do not excite our slightest suspicion? Yet if a blood test were made, some of them would show a positive reaction.

The point I wish to leave with you is that more careful survey of the mouth should be made on every patient and if a suspected lesion is discovered, follow it up until it is identified. In the more suspicious cases, refuse to do anything until a Wassermann is made. It is now a matter of routine in many of the best hospitals of this country that a blood test is made of every patient that enters. It is only by the strictest vigilance on the part of all branches of medicine that this disease may not get beyond our control. Will dentistry do her part?

#### MALIGNANT DISEASES OF THE MOUTH

When we consider the invariable outcome of a malignant tumor of the mouth when not treated, with its attendant horrors to not only the victim, but also his family, when we consider the improbability of successfully treating these cases in the advanced stages, then we can clearly conceive the advantages and importance of making an early diagnosis.

The dentist usually sees these precancerous conditions long before the sur-

geon for the reason that the average patient does not present himself to the physician until physical discomfort compels him to seek aid. At this time the disease has progressed to such a stage that makes the condition inoperable or at least, the probability of successful treatment is greatly reduced.

The fact that the dentist has the opportunity to observe these mouth conditions in the early stages is the reason that Blair places the responsibility of early diagnosis upon our profession in his well delineated statement expressed in the beginning of this paper.

I believe it to be the moral duty of every dentist, not only to examine the teeth of his patients, but to make a thorough examination of the mouth, lips, tongue, pharynx and tonsils.

Any rough surfaces on the teeth which are producing a constant irritation should be removed. In cases of small chronic ulcers or sores in the mouth, a complete history of the case should be obtained. If the history should lead to the assumption of former syphilitic affections, then it should be looked upon with grave suspicion. One of these precancerous conditions with which the dentist will come in contact is leucoplakia. This is invariably caused by excessive use of tobacco. It is characterized by the formation of white patches on the mucous membrane of the tongue and may spread to the cheek. In the tobacco chewers an outline of the quid of tobacco in a white patch is sometimes observed on the buccal mucous membrane of the gums and cheek in the vestibule of the mouth. Leucoplakia is an idiopathic disease, insidious in its progress which begins with an opaque or white spot. The most common site is the dorsum of the tongue. These spots may ulcerate and coalesce into larger ones. In their incipiency these cause little or no inconvenience and if discovered at this stage usually the removal of the cause will eradicate the disease. As the growth progresses, they become painful and the tongue, lips or cheeks as the site may be, become indurated and slight hemorrhages may occur.

At this stage we invariably have carcinomatous degeneration.

The similarity between leucoplakia and secondary syphilis is often confusing. The syphilitic plaques usually appear on the border and back of the tongue and at the same time other patches may be observed on the gingiva, palate or tonsils. The syphilitic spots are soft while those of leucoplakia are hard.

In the diagnosis of precancerous conditions of the mouth, we must ever keep in mind that any constantly continued irritation may predispose to malignancy. We must ever keep in mind that there is no part of the body that is so subject to continual traumatism as are the mouth, lips and tongue. We must not forget the fact that a large number of patients seeking dental services past the age of 45 years, present mouths with teeth that are broken down with sharp edges or the surface abraded through the process of mastication, leaving knife edge surfaces that may abrade the soft tissues, giving rise to a chronic ulcer which may ultimately lead to malignant disease.

Many of these precancerous conditions can only be correctly diagnosed by microscopic examination. It is clearly the duty of the dentist when a lesion is present in the mouth that can not be diagnosed as ordinary dental disease, to direct the patient's attention to it and, if possible, have a microscopic examination made. In obtaining a section, always obtain normal as well as pathologic tissue in the section.

## DENTIGEROUS CYSTS

This condition is frequently mistaken for a tumor or an alveolar abscess. It is frequently seen in mouths of men and women under thirty years. It usually takes the form of a cystic growth connected with teeth or tooth follicles when eruption is retarded. In the light of our present knowledge, the explanation for the formation of these cysts is largely theoretical. Thomes has given what seems to me the most plausible theory. He states that when the development of the enamel of the tooth is completed, its outer surface becomes perfectly detached from the investing soft tissue and a small quantity of transparent fluid not uncommonly collects in the interval so formed. This fluid ordinarily is discharged when the tooth is erupted but when from some cause the eruption is prevented, it increases in quantity and gradually distends the surrounding tissues causing a resorption and disintegration of the adjacent osseous structures. These cysts may go on developing until a large portion of the jaw is involved.

It may be differentiated from an osteoma, in that with the cysts, fluctuation and crepitation can usually be elicited. It may be differentiated from an alveolar abscess from the fact that the cyst is very slow in its formation and is not accompanied by pain. Sometimes a history of several months in its formation will be obtained.

The absence of any of the permanent teeth with the associated lesion suggests the possibility of a cyst.

An amber colored fluid may be aspirated from the cyst by means of the ordinary hypodermic syringe in completing the diagnosis.

The x-ray will show a definite cavity with a limiting membranous lining. The method of eradication consists of widely opening the cyst, removing the unerupted tooth or tooth follicles, entirely removing the cystic lining and treating the same as any other wound in the mouth of the same extent. It has been my experience that packing the cavity with iodoform gauze and irrigating with 5 per cent salt solution every 24 hours will yield good results.

The most serious sequela of a dentigerous cyst is the absorption of the bone against which the cyst exerts pressure. A large portion of the maxilla or mandible may be destroyed by pressure resorption resulting therefrom.

## EPULIS, A FREQUENT MOUTH TUMOR—FOUND OFTEN IN THOSE WHO ARE CARELESS IN CLEANLINESS OF THE TEETH

Epulis occurs most frequently in childhood and young adults. In a series of 167 cases Scudder reports 49 of them were in men and 118 in women. Thus it would seem that women are more susceptible to these mouth tumors than men.

The irritation from a carious tooth may start an epulis, or a tooth root may serve as an irritation which will encourage their development.

Calcareous deposits on the teeth may also be looked upon as a possible etiologic factor. Bloodgood states that epulis stands between the really benign, slightly malignant, and the malignant connective tissue tumors.

There are two varieties of epulis. The fibrous epulis and the giant cell epulis, the giant cell epulis being the more common.

The fibrous epulis is ordinarily of small size projecting between two teeth

and spreading somewhat over the alveolar border. This type may become calcified extensively or in limited areas throughout its substance. The fibrous epulis is smooth and quite firm on the surface, not very vascular and does not bleed very easily while the giant cell epulis is soft and irregular, and contains many vessels and bleeds easily when disturbed.

This growth is slow at first, but becomes rapid as it progresses and many times will cause the teeth to spread apart with consequent loosening. As these tumors enlarge, they may remain attached to a small stalk. At first these tumors are benign, but later may lead to malignancy. The importance of early treatment of them can not be overestimated. They should be removed as soon as identified and subjected to a careful microscopic examination. The portion of the periosteum or alveolar process to which they are attached should also be removed. This may necessitate the removal of one or several teeth in order to remove the tumor in its entirety and unless it is completely eradicated, the effort to obtain a cure will be fruitless.

There is a greater tendency to do an insufficient amount of cutting than there is to perform an operation that is too radical. After the complete removal of the tumor and its source, the actual cautery should be used to sere over the wound.

Another very important and not infrequent pathologic condition of the mouth which is of vital interest to the dentist is Vincent's angina. The lesions are associated with a mixed invasion of fusiform bacilli and spirochetes vincenti. The fusiform bacillus was first described by Miller in 1883 who found that the infection occurred in clean as well as in unclean mouths.

During the decade following 1896 Vincent, a physician in Paris, wrote extensively on both the organism and the clinical findings. He gave the disease the name of Vincent's angina. It is defined as an infectious disease of the mucous membrane of the mouth, throat and bronchi. This disease or one simulating it, is prevalent among the armies of Europe, and is referred to as "trench mouth" or "trench gums." The disease probably has no connection with trench life except the conditions made possible by the collecting together of large numbers of young men. The one condition which favors the development of the disease is oral sepsis. Vincent's angina is a very infectious disease and when it makes its appearance in the army it soon becomes an epidemic. The disease is characterized by a deep tissue necrosis, covered by a whitish gray membrane. This membrane is easily removed and when rubbed off leaves a granular raw bleeding base. This leads to crater-like ulcers with irregular edges.

Barker and Miller, Jr. A. M. A. Sept., 1918, classify the symptoms as follows:

Objective signs:

1. Insignificant as a rule of constitutional disturbances. The patient is not very ill.
2. Absence of fever, the temperature rarely rising over from 100 to 101.
3. Heavy and offensive breath.
4. Enlargement of the cervical and submaxillary glands, as a rule, moderately. They are tender and never suppurate.
5. The lesion itself.
6. Swollen, spongy and bleeding gums suggestive of scurvy.

Subjective symptoms:

1. The patient complains of extremely bad taste in the mouth.
2. Tenderness of the gums, so that the use of a tooth brush is impossible and mastication is so painful as to preclude eating.
3. Pain in swallowing.
4. Looseness of the teeth, with salivation which is common, resembling mercurial ptyalism.
5. Anorexia, or loss of appetite.
6. Joints painful.
7. Lassitude—"lack of go."
8. The most serious constitutional symptom and one always present when the teeth and gums are effected, is severe depression.

The prognosis is usually favorable. Most cases run a benign course. If seen early the case can be controlled easily. Internal medication has little or no value.

The care of the mouth is the first essential step in prosecuting the treatment. A solution of one-half of one per cent potassium permanganate used as a mouth wash every three hours will yield good results. The application of 7 per cent tinct. iodine to the pockets around the teeth and touching the ulcers with silver nitrate (concentrated solution) is recommended.

Emrys-Roberts—*British Medical Journal*, 1917, recommends the following lotion. Hydrogen peroxide, 5 fluid ounces; wine of ipecac, 3 drams; glycerin 5 drams; and water sufficient to make 8 ounces.

Local applications of arsphenamine in concentrated solutions or dusted over the surfaces are regarded as one of the best therapeutic measures obtainable. The mouth and teeth should be made as clean as conditions will permit before resorting to local treatment.

#### DISEASE OF THE ANTRUM OF HIGHMORE

What is the dentist's responsibility relative to the treatment of these cases? I believe that greater good and more satisfactory results can be obtained by co-operation of the rhinologist and the dentist in these cases. It is a matter of making a correct diagnosis. When the disease is of purely dental origin, then the responsibility should fall upon the dentist to handle the case. If the accessory sinuses are the etiologic factors in producing the disturbance, then the responsibility must rest upon the rhinologist.

There are just three principles that we must keep in mind in the treatment of empyema of the antrum.

1. Remove the source of irritation.
2. Drainage must be established.
3. Ventilation must be maintained.

In other words, treat it as any other abscess in the body is treated with the addition of maintaining ventilation.

I wish again to emphasize the importance of making a correct diagnosis. This is more important than the character of the operation. It is not of so much importance as to whether drainage is established through the nasal or oral cavities as it is that the source of irritation be removed. Too often dentists open into the antrum in the attempt to effect a cure when the source of irrita-

tion is in the frontal or sphenoidal sinuses or ethmoidal cells. In these cases only two of the three principles are carried out, viz., drainage has been established and perhaps ventilation maintained, but the antrum still discharges because the source of the trouble is still present. It is such cases that have led to the criticism of the Caldwell-Luc operation, or opening the antrum through the canine fossa. A criticism that is frequently made is that the opening will not close. Of course it will not close if pus is continually discharging through it. If the source of irritation is removed, it has been my experience, and in this I am sustained by many others, that it is difficult to keep the antrum open long enough to treat it. This whole proposition can be reversed if the source of irritation is of dental origin, then opening through the nasal fossa will not avail a cure. It merely establishes a drainage. Hence again, the method of operating is of secondary importance.

In cases of empyema of the antrum, when the source of irritation is of dental origin, I prefer opening into the antrum through the canine fossa, making the opening large enough to explore the antrum with the forefinger, thus septi may be discovered and cut away if necessary. The antrum is then irrigated with a 5 per cent salt solution and packed with iodoform gauze for 24 hours. The gauze is then removed and not replaced, but a gutta percha button is fitted to the opening to keep out food debris, etc. The antrum is then irrigated every 24 hours for 3 or 4 days, then the irrigations are made less frequent. The gutta percha button is cut down each time of treatment until it is reduced to 5 mm. in diameter, when it is left out entirely and complete repair takes place.

We shall now consider briefly a phase of one of the most common pathologic conditions found in the mouth, viz., those morbid conditions involving the pericemental membrane. The writings on the subject of mouth infection have been voluminous during the past five years, and in this discussion we shall confine our thoughts to the eradication of those infections found at the ends of the roots of the teeth.

\*Dental and medical science have made it clear that pathologic conditions of the pericemental membrane and diseased ends of the roots of the teeth are a contributing factor to, and frequently the primary cause of, general systematic disturbances. The physician and the laity are looking to the dentist to eradicate these conditions. This can be done in one of two ways:

1. Extraction of the tooth followed by curettage.
2. Surgical interference at the focus of infection, mechanically removing the morbid condition leaving the healthy tissues to go on functioning.

It is a well-known fact that with our present methods of root canal therapy few of these morbid conditions can be so corrected that we can conscientiously assume that the area is free from infection, and will remain so.

By what steps then are we to decide whether extraction of the tooth is indicated or whether the greatest service to the patient can be rendered by root resection? No hard and fast lines can be drawn as to just when root resection is indicated and when extraction of the tooth should be the operation of choice. Here again we come to the great question mentioned in the first part of this paper, viz., diagnosis. A correct diagnosis of each case is not a simple matter.

\*Lyons—Indications and Contra-indications for Root Resection.



The first question to determine is: Are general conditions favorable to normal repair of bone? To determine the answer to this question, there are several vital factors that must be taken into consideration. First, the present state of health of the patient; second, the past illness, and the possible recuperative or reserve force of the patient. The lowering of the vitality through chronic alcoholism or such diseases as tuberculosis, syphilis and diabetes which lead to a state of constitutional dyscrasia will have a profound influence in preventing repair, and re-development of normal tissue.

Age is another factor which should be considered. In the aged, the process of repair is slow and the prognosis for bone regeneration is not so good as that in the young or in middle life. In the aged the operation of root resection is not undertaken without considerable hazard. The normal or abnormal circulation of the blood is still another factor that plays a very important role in making up a judicial diagnosis. It is an established surgical fact that without a certain definite blood supply to a part, repair of tissue will not take place. Notwithstanding the fact that the teeth and surrounding structures have a very rich blood supply, in certain types of individuals and under certain pathologic disturbances there is not sufficient blood supply to the apical area to insure repair of the parts after the operation of root resection.

The clever diagnostician will discover this condition before making his final decision as to the character of his operation.

#### THE X-RAY IN DETERMINING THE OPERATION INDICATED

The proper evaluation of x-ray findings is very important to correct diagnosis. If the case is of an alveolar abscess of long standing, or a case of imperfectly filled root canal with granuloma showing in the apical area where all of the evidence points to disease or death of the pericemental membrane in the apical areas, it is my opinion that surgical procedure rather than dental therapy is indicated.

The character of the surgical procedure may be root resection in favorable cases and extraction of the tooth in the unfavorable ones. Here again another question arises—what are the points of differentiation of the favorable and the unfavorable cases?

It is a lamentable fact that many men are resorting to root resection as a short cut method for curing an alveolar abscess over a beautiful crown or bridge attachment without first removing the same and sterilizing and filling the root canals. If the canals and dental tubules are not previously sterilized and the canals thoroughly filled, a re-infection will occur from the tubules exposed when the resection is made.

It is not permissible to leave a crown on an imperfect foundation because it is a masterpiece of art. If it is not worth while to remove it and sterilize the canal and tubuli, then it should be extracted.

Too often root resection is resorted to for the purpose of saving a nice piece of bridgework and the patient's health is jeopardized. We are not doing good surgery when, as a matter of routine, we do not insist that the canals be sterilized and filled just previous to the operation.

The question of sterilizing and completely filling canals in multi-rooted

teeth for the eradication of an infection, is a very doubtful procedure and in my opinion the patient's welfare will be better taken care of by extraction followed by curettage of the bone. In no cases should this operation be resorted to when the bone and pericemental membrane are diseased beyond the apical third of the root.

The technic for the operation of root resection will vary with the individual operator. Equally good results will be obtained by methods that are quite different. The greatest factor in the success of the operation is a correct diagnosis of the case. The welfare of the patient should be the first consideration; a hasty diagnosis will often lead to failure, and the patient will consequently have to suffer from the operator's misconception of conditions.

# DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

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It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

## THE USES OF THE X-RAY IN MODERN DENTISTRY AND MEDICINE\*

BY FRED W. ZIMMERMANN, D.D.S., YOUNGSTOWN, OHIO

THE x-ray, as most of us know, was discovered in the year 1895, by William Conrad Roentgen, and has also been known as the roentgen ray, being so named after the man who discovered it. It has only been within the last few years, however, that the dental profession was awakened to its almost unlimited use and wonderful diagnostic aid in the practice of dentistry.

The use of the x-ray in dentistry is not a fad, as some men are inclined to believe, but an absolute essential and necessity for correct diagnosis. In fact many of our best diagnosticians in both the profession of medicine and dentistry often demand a full mouth x-ray examination of patients presenting themselves for treatment.

The time has at last arrived, when we are able by the use of the x-ray to see the results of our work and efforts. By employing the radiogram, nearly all guesswork is eliminated, and we should, for that reason, be able to give the public greater and better service than ever before in the history of dentistry. There are some few instances, however, in which the x-ray may not be regarded as infallible evidence, but in the vast majority of cases the evidence which it produces is an absolute reflection of existing condition. Such conditions as periapical abscesses, cysts, necrosis, osteomyelitis, sequestra, lost roots, root canal work, broken broaches or instruments in root canals, perforations of roots, fragments of instruments lost in the surrounding tissues, pre-operative orthodontic treatment and check up and impacted and missing teeth are definitely located through the aid of the x-ray, when all other diagnostic means have failed.

\*Read before the Alumni Society of the Dewey School of Orthodontia, St. Louis, Mo., March 6-8, 1919.

Also in pyorrhea cases, the dentist is enabled to determine which teeth can be treated and retained, and which are to be extracted.

One of the most interesting subjects in the whole field of radiography is that concerning the use of the x-ray in dental and medical practice. The dental radiogram offers practically the only certain means of detecting and locating focal infections with pathologic conditions of the teeth, jaws and surrounding tissues of the oral cavity, which are established as etiologic factors of constitutional conditions or secondary lesions localized almost in any part of the body. Such secondary effects or lesions may include all manner and forms of symptoms such as pains in the head or neck, neuritis, arthritis, appendicitis, gastrointestinal disturbances, endocarditis, rheumatism, inflammatory lesions of the eye, abnormal mental condition, including melancholia, irritability, insomnia, neurasthenia and temporary insanity. Should any one or more of these conditions be present, a complete x-ray examination should be made of all the teeth and roots before the dental operations are carried on.

One can see by the number of different diseases just mentioned that almost every branch of medicine and surgery is affected, and hence the men specializing along these lines must or should all be interested in dental radiography. For this reason the need of absolute cooperation among all the specialists of medicine and surgery can not be overestimated.

It is a known fact that many of the dental conditions that cause the more serious secondary disturbances, do not always make known their presence by the symptoms of pain. In the majority of cases, if they did, the patient would immediately seek the dentist and treatment would be instituted before other harm resulted. Any number of these painless dental lesions are found, not by the dentist, but by the specialist during the course of routine radiographic examinations, which were made upon advice after the patient had appealed to him for relief from the secondary lesions.

It is usually a daily occurrence to have patients presenting themselves to the physician, internist, neurologist, orthopedist or other specialists for relief, because of symptoms arising from secondary lesions, and in case after case, these secondary lesions by the aid of the x-ray can be traced back to dental conditions. So it behooves us to see that infection is removed, whether due to unfilled roots, abscessed teeth, pyorrhea or what not.

In cases presenting themselves for radiograms, it is imperative that the very best radiograms are taken, and if any area is at all doubtful, other radiograms should be made at different angles. It is often very surprising how differently a condition will appear when taken from several different angles, and oftentimes a tooth at one angle appears to be perfectly healthy, but taken at different angles will often show up a large area of infection.

The x-ray picture, as we all know, is only a shadowgraph, and never a clear photographic expression of the true pathologic condition. It is for this reason that distortions due to different density of structures and difference due to angles of focus, are often responsible for wrong impressions. It is for these reasons also that infected areas are sometimes permitted to pass unnoticed by the x-ray.

It is a known fact that in some of these unrecognized foci of infection, the

most danger lies. This is more than true when the patient has been informed that the x-ray shows nothing, when as a matter of fact the foci of infection may be there, and the cause of considerable or all of the systemic trouble present. So it behooves the roentgen operator to use every precaution in obtaining the very best radiograms so as to be enabled to give a correct scientific diagnosis. Very often, the size of the darkened area above the apex of a tooth is taken as an indication of the amount of harm that might result. This is indeed entirely wrong, as oftentimes the most virulent infections are found in the smaller area. And then again, an area of increased transparency, instead of meaning that it contains an active infection, may contain a granuloma in which the infected area has undergone the process of repair or may still contain infectious matter, ready to become active upon the slightest irritation.

It has been stated by Schuhmann, that certain sinus shadows over teeth are often caused by drugs employed in treating and devitalizing teeth; these drugs acting as strong escharotics and causing a coagulation of lymphoid matter over the root end which appears as a shadow over the apex of the tooth. So using all the care and skill one can in making a diagnosis on dental radiograms, he will still make a few mistakes. I am of the opinion that no one should pass judgment on a set of radiograms without first seeing the patient or having a full history of the case, and that more definite results will be obtained if the radiograms are studied after a careful examination of the oral cavity and surrounding tissues, taking into consideration the general systemic condition of the patient.

It is now considered a positive fact that no matter how well teeth are treated and how well the root canals filled, there is still some element of doubt as to whether or not there may be some hidden infection present and Rosenow makes a statement to the effect that every devitalized tooth has an area of lowered resistance about the root end and should be considered unsafe.

Beginning or inflammatory changes of bone infection are not discernible in the radiogram as it does not at once produce gross bony liquefaction. After several days or weeks there is sufficient decalcification for recognition; so when an area is found over an apex, it is hard to determine the length of time infection may have been present.

I will mention a few conditions in which I believe infected teeth should be removed rather than treated.

Third molars, around which will be found pockets harboring bacteria, due to the fact that there is usually not enough space to completely erupt, and the tissue overlies the enamel surface but can not attach.

All pulpless teeth over which there is a cyst, removal is usually necessary and also the entire cystic membrane, to prevent too great a loss of bone due to the continuous pressure of the cyst wall on adjacent structure and often becoming secondarily infected, causing a great deal of trouble.

Teeth which have been treated and the walls of the canals perforated, the usual result being an alveolar abscess, should be removed.

In the process of treating teeth, one often encounters a condition where it is impossible to gain access to the infected area through the root canal, due perhaps to the fact that a phalanx of cement has been forced into the canals

which can not be removed, also broken broaches are often met with high in the root which can not be taken out, so the tooth should be extracted.

Teeth infected from pyorrhea, where the radiogram shows the bone structure gone to any great extent, should be extracted, as should most teeth which show a definite area of infection on a patient who is showing evidence of the absorption of toxins.

In conclusion I wish to say, as a result of information gained through the use of the x-ray, that teeth should not be devitalized so promiscuously as a few years ago, but an effort made to save every vital pulp possible.

#### DISCUSSION

*Dr. Carl C. Johnson, Memphis, Tenn.*—I did not know until I came here that I was scheduled to open the discussion on this paper. I feel unqualified to discuss the subject of radiography, as I know nothing about it. However, I enjoyed the paper very much.

*Dr. T. E. Purcell, Kansas City, Mo.*—I wish I might have had a chance to read this paper before discussing it, because I feel that the author of this paper is dealing with a subject that is rather dangerous to the average dental practitioner.

From this paper, the indications are that in the near future we shall not be leaving any teeth in the mouth for reparative work. The men who are here today, like myself, have practiced in a general way for some time, and we recognize the fact that we have various lesions, such as those spoken of in the paper, with which to contend in our everyday practice. If you take out every tooth that is infected by pyorrhea or is involved by an alveolar abscess, you are taking out teeth which should challenge the ingenuity of the dental profession to save. The mere extraction excludes from the dental profession the use of that skill which its members possess and are supposed to have in order to correct the conditions mentioned.

We are very apt to let the pendulum swing too far on the question of wholesale extraction of teeth. It is the most dangerous phase the profession has to face. We have extraction specialists in all large cities to whom the average family physician, when he can not find any cause for the condition he is treating, sends his patient with the advice that all teeth be extracted. Then, later, if the patient's health is not restored, something else is resorted to. It is a good deal like what is done in Texas—they shoot negroes and say halt afterwards. (Laughter.) A great many physicians advise extraction after seeing a radiogram of a tooth which is abscessed or where there is an absorbed area below the end of the root. Yet there are many of these cases which have yielded successfully to treatment, although it takes several months before new deposit of bony structure will resist the ray enough not to show the absorbed area. Taking the picture of a tooth at once after it is treated for an alveolar abscess is not fair to the operator and does not mean that there will not be repair of the tissues afterward.

I am one of those who believe that the treatment of pyorrhea is more or less mechanical, and that very little is accomplished by the use of serums and with drugs. I am reminded of the case of the lady from Atlanta who went to her family physician with the complaint that there was something the matter with her nerves, and that her teeth were loose. He said he could fix her teeth. She made visits to his office and was given a course of hypodermic injections of emetin, but her teeth remained loose, and when she so informed him he said, "It is strange, I never had a case of that kind before that was not cured." She told him her teeth had been loose ever since she had them made more than a year before.

We must use sound judgment in the treatment of all our cases if we save our patient from being toothless, and also we must not allow the medical profession too much leeway by having these cases go from the family physician to the extraction specialist. Surgery is just as dangerous in the hands of some men. Because a patient comes with an infected finger, the surgeon would not cut off the hand. I believe it will not be long until the medical men and dentists together will learn to handle these cases in the proper way.

The orthodontists have seen the necessity of keeping all the teeth if it is possible to do so. There is a combination of circumstances here that is hard to remedy, but except in extreme cases, we must not recommend that the teeth be extracted at once.

I should like to hear other members discuss this paper and the treating of these cases by different means than the wholesale extraction of teeth.

*Dr. E. G. Weeks, Saginaw, Mich. (closing for the essayist).*—Dr. Purcell is a fine looking fellow; he is progressive, but he is on the wrong track. Dr. Purcell has a wife. If I came along with a pistol and pointed it at her, he would not know whether it was loaded or not, and yet I am sure he would make an effort to knock it out of my hand. Now, how does he know what areas are infected and what areas are not?

*Dr. Purcell.*—I don't know.

*Dr. Weeks.*—You say you don't know. Maybe you have not followed the work of Dr. Price of building in new bone in rarefied areas. Dr. Price showed slides and moving pictures of the case of a young lady who came to his office when the x-ray first came out. She had two large rarefied areas over a bicuspid tooth. Dr. Price in his general practice condemned root canal work. He went to work and filled this tooth and followed it up with x-rays, and felt proud of his job. He filled this tooth clear to the apices. In four or five months he took another picture and found the area filled with new bone. He was prouder than ever of his job. He talked about it before societies and of how new bone was built in there. Sixteen years later he went with the National Dental Research Commission, and in the meantime this patient also moved to Cleveland. He came in contact with her; one day he phoned her as he had learned that she was a great sufferer from rheumatism. He was doing a lot of investigation along the line of root canal work and of infections around rarefied areas, and this woman came before his mind, and he called her up by phone. On arriving at his office he said to her, "Do you mind sacrificing two teeth for the benefit of science?" She replied, "I will do anything you want me to do." He told her that he was going to extract these teeth. He extracted the teeth and took both of these new bone areas that were filled in and grew beautiful cultures of the streptococcus group. He has done that many times since in other cases, and has found almost universally that there was an infected area in the new bone growth, that is, the apical area. If even 70 per cent of these cases are of an infected nature, have you any right to say which is infectious and which is not infectious? Have you any way of proving it?

Now then, we know what infection will do to the general system. You get away from the fact that there are men in dentistry who can restore these conditions. I should say, if we want to keep this pretty girl in a good condition, we had better extract the tooth or teeth with rarefied areas.

Dr. Rickert, of the University of Michigan, under Dr. Vaughan, has been making investigations along the line of root canal work, and he has yet to find a tooth without multiple foramina regardless of what tooth it is. They have one or more foramina. The dental students will enlarge the canals, ream them out, but do not go to the branches because they didn't know there were any branches. If you leave a minute particle of the pulp, it is dead tissue and you are certain to get infection arising from some one of the multiple foramina. Rickert says that he does not go down and take all the nerve out, but he takes out what he can from the coronal portion. He is following Percy Howe in that he is impregnating a portion of the nerve with the precipitate of silver. If it stops up the apical foramen, if it sets up chemical irritation, you have scar tissue and infection finds its seat in the scar tissue. I will venture to say that in five years the teeth will have rarefied areas and they will be extracted.

This paper speaks of the infallibility of the x-ray. That is true—at least it was true in my own case. I always give my patients a chance and try to save their teeth, if it is possible to do so.

In my own case I had my assistant make an appointment for me and I could not get that appointment. Finally, I had a heavy feeling in this side of my face (indicating); I went to an exodontist who took hold of my case and removed three of my teeth. I have

at least one hundred x-ray pictures in my own office of my own case and there are no rarefied areas in any of the teeth. On the lingual side of the buccal roots and lingual roots there was found a large mass of pus which I had been absorbing. The x-ray did not show it.

Dr. Purcell says we are taking away from the dentist his rights or his professional ability. I will say to him and to the other fellows, if you do not get busy and practice prevention, physicians will send patients to the extractor, and I believe most of us should go to the extraction specialist instead of having ionization or ironization.

*Dr. T. E. Purcell, Kansas City, Mo.*—Dr. Weeks and I can cross wires with the best of feeling in the world and continue to do so as long as we continue to come to these meetings. I still maintain, Mr. President, that Dr. Weeks' position is wrong from every angle of professional practice. It is wrong because I could take Dr. Weeks to a bacteriologist and have him take a culture from his tonsils and find tubercle bacilli and probably diphtheria bacilli, and yet it would not mean that he was going to die either of tuberculosis or diphtheria. We must consider the theory of ionization.

I heard Dr. Price tell the story of the patient with rheumatism, and that he cured her by the extraction of these teeth, and I dare say that millions of teeth have been extracted since that time to cure rheumatism, but it has not always cured it. The dental profession has the inherent right to work this matter out to their own salvation. I do not believe in sacrificing teeth unnecessarily. I have read the articles of Dr. Price and those of Rosenow, and while they have come to the conclusion that such and such is the case, in ten years from now they may take the opposite view. They have to change their minds, which, of course, they have a right to do. The dental profession has a right to take care of the dental organs and to find out the cause and correct it, if possible.

I agree with Dr. Weeks in regard to preventive dentistry. I agree with him that the profession is lame on that phase of the subject, but whenever we come to the time and say that because we have a dental lesion the teeth must be lost, the dental profession and orthodontists are lame ducks. They are not doing their duty to humanity. Every case of rheumatism is not caused by infected areas around the roots of teeth.

I have heard Dr. Rhein and Dr. Price lock horns on ionization, and that according to Dr. Rhein, Dr. Price denying it, ionization would remove any danger of infection. We shall never get the human body free from infection, but we have immunity. If the theories built up in such papers as we have heard are maintained, there would not be a human being in this room. We would have been dead long ago. The dental profession must solve the problem, but not solve it by extracting the teeth.

*Dr. Weeks.*—The problem will be solved in my judgment by the extraction of the teeth until such time as it can be proved that the teeth do not cause damage to our health.



# **ABSTRACT OF CURRENT LITERATURE**

**Covering Such Subjects as**

**ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY**

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

## **Myristica (Nutmeg) in the Treatment of Pyorrhea Alveolaris Associated with the Parasitic Endameba. L. Leidy. The Dental Cosmos, 1919, lxi, No. 4, p. 295.**

The use of myristica (nutmeg) is recommended by the author in the treatment of pyorrhea attended with endameba in the secretions and in scrapings from the seat of infection. On the basis of recent experimentation, nutmeg would seem to be a preparation well worthy of trial. Very gratifying changes have been produced in the appearance of the gums, with lessening of the discharge and tightening of the teeth, while the secretions and the scrapings from about the soft parts have been rendered free from any form of ameba. Grated nutmeg containing the volatile oil should be administered in 30 grain doses, after meals, without the addition of water. The patient should be instructed to chew thoroughly before swallowing and to take the last dose before retiring, allowing the preparation to remain in contact with the gums during the sleeping hours, the treatment thus being both local and constitutional. For adults, 30 grains of the grated nutmeg is an average dose and may be used with impunity. The duration of treatment should be extended from two to three weeks, during which time microscopic examinations should be made at frequent intervals, until the parasites have been made to disappear by the action of the remedy.

## **Erythrophlein Hydrochlorid as an Agent for Devitalizing the Dental Pulp. N. Black. The Dental Cosmos, 1919, lxi, No. 4, p. 296.**

Being impressed by the wonderfully speedy, painless action of this drug, the author strongly advises all operators to test its worth for themselves, remembering that it is a very powerful drug, and therefore, to be handled with caution and respect. The technic of the employment of erythrophlein for the devitalization of pulps is similar to that carried out when arsenic is the drug used. With a weak, warm alkaline antiseptic wash away all debris. With sharp instruments cut away as much carious dentine as can be removed without causing pain. Do not especially seek to expose the pulp. Isolate the tooth, and de-

hydrate it with chloroform. With warm air evaporate all moisture, and the cavity is ready for the application. Take an extremely tiny pellet of cotton (as small as can be conveniently handled in dressing tweezers), dip it in throphleol and apply to the center of the floor of the cavity. A mere smear of the drug on the floor will act quite efficiently and is best in very shallow cavities. Do not apply the dressing direct to the exposure if it is an old one, but rather to the dentine at a little distance from the exposed spot. Seal in the dressing carefully with a water-tight temporary filling, such as one of temporary gutta-percha or calxin. Leave the dressing *in situ* for forty-eight hours, and then proceed as after devitalization by any other method.

There are three classes of cases in which the author considers the use of erythrophlein as justified and even indicated: (a) Shallow cavities which have produced considerable pain, and therefore, call for devitalization. (b) Pulp requiring destruction in the mouths of patients so sensitive that they will permit no operative measures until the tooth is free of sensation. (c) Where drug devitalization must be accomplished speedily. (d) Devitalization in mouths where other methods have proved unfortunate.

The two outstanding features of the use of this drug for devitalization are the speed of its action and the minuteness of the dosage. Twenty-four to forty-eight hours after its exhibition, in a favorable case, the pulp is usually a white bloodless thread. The drug presumably has a special and rapid action on nerve and nerve-like tissues, seeing that the action is as satisfactory when the application is made far away from the pulp as when the devitalizing agent is placed close to it.

### **Infectious Complications After Dental Extractions. Dr. Keraudren. *Journal des Practiciens*, 1919, xviii, p. 281.**

Dental extractions under local anesthesia are not uncommonly followed by a special localized infection. On the day following the extraction, the affected region becomes congested and very painful, under progressive development of a hard swelling, apparently continuous with the bone, especially in the case of the lower jaw. Fluctuation and discoloration of the skin are absent; the pain is most severe at night, so as to prevent sleep. Examination of the mouth shows neither swelling nor incipient abscess formation around the tooth socket or in the gingivolabial fold. These symptoms persist from eight to ten days, sometimes a little longer, and gradually subside without softening having been demonstrable at any time. When located in the upper jaw, the pains sometimes resemble typical attacks of facial neuralgia. Ordinary analgesic remedies are not as a rule very helpful, the best treatment consisting in the application of hot compresses and irrigation of the mouth.

These complications are referable to periostitis of infectious origin, through imperfect asepsis, the dental syringe being usually responsible; for dental syringes which can be completely sterilized, do not exist. It is advisable to keep the syringe, or rather its separate components, in a solution of formol, or in a flask of chloroform. Another cause of infection through local anesthesia is found in the habit of certain dentists to keep in stock a flask of their favorite

anesthetic and to insert the syringe in this flask, as required. Under these conditions, it is difficult to keep the solution sterile for any length of time, the flask being constantly reopened and the extremity of the syringe not always sufficiently sterilized before insertion. Solutions of cocain and its deviates must moreover be freshly prepared, as otherwise, they favor the onset of infection. The risk of infection through the fluids of the mouth is advantageously diminished by lightly painting with iodine tincture the parts where the needle is to be inserted. Finally, after the tooth has been extracted and the bleeding controlled, the empty alveolus may be irrigated with a little oxygenated water or a weak solution of hydrogen peroxide. By observing all these precautions, including, of course, the ordinary asepsis of the instruments, the above described infectious complications after dental extractions can be avoided with a fair degree of certainty.

**Diseases of the Mouth as Focus of Metastatic Affections.** De Vecchis. *La Riforma Medica*, 1918, xxxiv, No. 4, p. 71.

In this analytical review of the corresponding literature, the author calls attention to the different localizations of metastatic and general diseases of buccal origin in the blood and vascular system, in the glandular system, in the gastro-intestinal apparatus, in the joints, in the respiratory system, in the skin, in the nervous system, and various other affections, such as epulis, cancrroids, and sinusitis. Relations have been established between preexisting lesions in the mouth cavity and malignant tumors. Dysphagia and dysphonia of dental origin have been described. A variety of diseases of the internal ear have been referred to oral sepsis; likewise, retropharyngeal abscesses and a few diseases of the eyeball. Lymphangitis, inflammation of the submaxillary and sublingual glands, adenophlegmons, may be observed as metastatic localizations of buccal infection and intoxication. The Italian literature contains references to two cases of cervical phlegmon and a case of abscess in the subclavian region, shown by radiography to be derived from dental caries of the fourth degree and alveolar osteitis. Bright's disease has repeatedly been traced to pyorrhea alveolaris. Oral microbes may penetrate into the stomach and intestine, causing dyspepsia, gastric catarrh, ulcer of the stomach or duodenum, enteritis, and mucous colitis. Cases of acute appendicitis of alveolar dental origin, have been reported. The joints may be affected in the form of acute articular rheumatism and arthritis deformans. Arteriosclerosis, aside from the known pathogenic factors, may depend upon toxic disturbances induced in the composition of the blood through oral sepsis.

**Two Cases of Dislocation of Teeth.** H. Mearns Salvery. *The Lancet*. London, 1919, i, p. 339.

Replacement of dislodged permanent teeth is advocated by the author, on the basis of two favorable experiences in youthful individuals. He was unable to find any literature on the subject, nor has he heard of similar treatment being adopted in the same circumstances. The first patient, a boy of thirteen years, as a result of an accidental blow in the mouth from a stick, suffered a complete

dislocation of his two upper central teeth, which hung loose in the mouth and dropped into the author's hand on being touched. Considerable laceration of soft parts and loosening of adjacent teeth was present, the parts were cleansed with a solution of flavine (1:1000) and all bloodclots were removed from the cavities. The two teeth, which were not broken in any way and had been temporarily placed in saline, were then replaced, the laceration of the gum necessitating a few points of silk suture. The patient was furnished with a lint pad to bite on, and the jaw was held up fairly tightly by a jaw bandage. Fluid diet only was allowed. Pad and bandage were kept on for 48 hours, ensuing treatment consisting in fluid diet and thorough cleansing of the teeth and mouth twice daily with swabs soaked in a flavine solution of the strength stated above. In five or six days solid diet was gradually given. Six months later, the condition was found to be quite satisfactory; the patient for some time had been able to bite apples and tackle hard crusts with no discomfort.

The second observation concerned a youth of 18 years, who was kicked in the mouth while playing football. The first and second bicuspid and first molar teeth of the right upper jaw were turned almost upside down, the crowns being forced up and separating an appreciable portion of the alveolar margin. The author did not take away the teeth, there being a considerable attachment of gum. The parts were cleansed as in the first case. The restoration of the "bite" was more difficult in this instance, owing to the destruction in the continuity of the alveolar margin. After considerable manipulation, this was accomplished and after treatment instituted as in the first case. The patient was discharged some time afterwards. The only fault in an otherwise perfect result was that two of the teeth were a fraction lower than previously, but this caused no inconvenience.

**Intra-oral Skin Grafting. The Establishment of the Buccal Sulsus.** H. P. Pickerill. *Proceedings of the Royal Society of Medicine. Section of Odontology*, 1919, xii, No. 3, p. 17.

The author emphasizes the necessity for adequate buccal and labial sulci, for the proper performance of mastication as well as speech, on the part of the jaw, lips, tongue and cheeks. Adequate sulci are likewise a requirement for the wearing of stable artificial dentures. Obliteration of the buccal and labial sulci, actual or relative, may occur as the result of a variety of general causes, notably excessive atrophy of the alveolar processes; hypertrophied buccal and labial frena; ulcerations due to alveolar abscesses, ulcerative or gangrenous stomatitis. War wounds of the jaws through gunshot projectiles were almost invariably followed by adhesions between the lips and cheeks and jaws, with obliteration of the buccal sulci and resulting difficulty in plastic restoration of the lips or in adjustment of an artificial prothesis.

To the older, more or less unsatisfactory methods of treatment of this condition, the author adds his original procedure of intra-oral skin-grafting. Based upon a number of considerations, including his experience in other skin-grafting operations, that pressure, even and continuous, the obliteration of dead spaces, seems to be the most essential factor for a success, the skin grafting of a re-

established buccal sulcus was done by him directly into the mouth and under pressure, with immediate and most gratifying success. The method has been utilized by him since February, 1918, without a single failure. Given accurate technic, the establishment of the sulcus and the skin-grafting of its surface will be certain in every case. General or local anesthesia may be used as indicated in each particular case. In view of its uniformly good results, the method is recommended in the treatment of gunshot fractures of the jaw as well as for many cases occurring in civilian practice.

**Method of procedure for intra-oral skin grafting:** When adjacent teeth are present, an appliance similar to a dental splint, constructed previously, is used with advantage. This appliance carries an arm attached to it by screws, and to the arm is attached a perforated shield which will approximately fit in the sulcus when established. An incision is made dividing the adhesions, keeping the knife close to the bone. Bleeding is arrested. The shield is covered with modelling composition and an "impression" obtained of the raw area of the sulcus. This is removed. A Thiersch skin graft is cut from the arm or leg and placed raw surface upwards upon the impression of the sulcus, it is smoothed down flat and passed up into place and the arm secured by the screw provided. Thus the skin-graft is pressed evenly into all the unevennesses of the sulcus, and maintained there with constant pressure. When no teeth are present, the procedure is the same in all particulars except that the "impression" is ligatured into place and maintained there with circumferential silk-worm gut ligatures in the lower jaw or by passing sutures through the palatal mucoperiosteum and cheek or lip in the upper jaw.

#### **Displacement of the Mandibular Meniscus and Its Treatment. Hosarth Pringle. *British Journal of Surgery*, 1919, vi, No. 23, p. 385.**

Four cases of this uncommon but extremely distressing condition came under the observation of the author, who personally suffered from the displacement, the meniscus acting as a foreign body and preventing complete closure of the mouth. In order to understand and correct the mechanism of the displacement, the anatomy of the meniscus must be mastered more thoroughly than is possible on the basis of textbook descriptions. The disc presents a central thickening in the coronal plane over the summit of the condyle of the jaw. In front of the ridge is a distinct depression in the disc which fits the tuberculum articulare of the temporal bone, while below and anterior to this is a second thickening, which forms the anterior border of the disc and has the external pterygoid muscles attached to its lowest part. The posterior portion of the disc trails off from the thick coronal ridge, and lying in close contact with the posterior surface of the condyle, becomes lost in the fibrous tissue of the capsule of the joint. In the author's opinion, displacement of the meniscus is usually due to overaction or irregular action of the external pterygoid muscle, the disc becoming dragged askew. It goes forwards and inwards, so that its thick central ridge becomes placed obliquely instead of lying in the coronal plane. After displacement the disc acts as a foreign body, being either caught between the condyle and the tuberculum articulare or moving with the condyle and preventing

the latter from clearing the articular eminence. Displacement usually occurs during yawning or sneezing, or in forcible opening of the mouth by a gag as in dental extractions. The mouth can not be closed completely, and efforts to do so cause severe pain in the regions of the joint, with the sensation of a foreign body interfering with the movement.

The displaced meniscus may remain in its abnormal situation for days at a time until reduced, or it may slip in readily and be subject to repeated displacements. Reduction can usually be accomplished by keeping up strong pressure behind the condyle with the mouth open, and then slowly closing the jaw.

Recurrent displacement of the meniscus is associated with well-marked relaxation of the tissues, ligaments and muscles around the joint, so that it is impossible to maintain the disc in position, and operation is required. Under these conditions, the loose disc may be sutured to the periosteum, as was done by Armandale in two cases. Excision of the displaced meniscus, with satisfactory results, was performed in one of the author's cases, concerning a young woman twenty years of age, whose left mandibular meniscus was remarkably loose and could be dragged freely over the condyle in whatever position the mandible was placed.

**The Early Diagnosis of Lead Poisoning.** G. L. Apfelbach. *The American Journal of the Medical Sciences*, 1918, clvi, p. 781.

With special reference to the blue line, the deposit of lead sulphide on the margin of the gums occurs only when there are teeth and when they are ill kept. The line has a grayish-black tinge, the surrounding gum being somewhat bluish, as in Chadwick's sign of pregnancy. The occurrence of a blue line on the gums indicates metallic absorption and does not always indicate the use of lead, nor does this blue line indicate illness or disability, nor does its absence prohibit the diagnosis of lead poisoning. In the writer's series of 72 cases the lead line was observed in only 36.1 per cent. Lead not only produces this characteristic phenomenon on the gums but seems to destroy the teeth so that one will see lead-workers more often with decayed teeth and pyorrhea than with a lead line. In 150 painters a blue line was observed only 5 times, loose teeth 32, decayed teeth 52, and pyorrhea 32 times, only eleven painters were observed with good teeth. This condition is not seen in other trades of the same nationalities, habits, house and living conditions.

**The Etiologic Importance of Dental Infections.** Barrymore Marco. *American Medicine*, 1919, No. 5, p. 286.

Apical infections or blind abscesses have been responsible, in the author's experience, for many diseases, including ailments in parts of the body at a great distance from the teeth. Gastrointestinal disturbances, appendicitis, heart disease, arthritis deformans and rheumatic fever, diseases of the blood-making organs, nervous diseases, such as neuritis and paralysis, are represented among the pathologic conditions induced by infected teeth. A highly instructive case, illustrating the far-reaching consequences of apical infections, recently came under the author's observation, concerning a patient of fifty years, whose right eye

had been removed about two years previously. On account of failure of vision in the remaining eye, he consulted a specialist on whose advice radiograms of his teeth were prepared. A well-defined apical abscess was discovered at the root of the upper right canine, which carried a pivot. After extraction of the offending root, a virulent growth of streptococci was obtained by cultural methods. The patient was treated with an autovaccine in the form of injections, assisted by other internal treatment including potassium iodide, and the condition of the eye gradually improved together with the general health.

**Root Canals or Not. G. L. Junkerman. Dental Facts, 1919, vii, p. 15.**

While not contending that satisfactory root canal work can not be done the author feels assured that it is not being done. At the present state of our knowledge, a root canal perfectly filled is the result of accident and not the result of an exact science. There is no field in which curative dentistry is so lame as in sterilizing and filling root canals. His observations lead him to believe that the thinking element of the profession is not trying to save as many teeth, crippled by neglect, as it did a few years ago. Public health is being better served by this seeming sacrifice of teeth. Dentistry is one of the most exact sciences of public health. If there is any part of it not so, justice to ourselves and the public demands that we discontinue that part of it until research has made it so. This is the very thing that many dentists are doing with root canal work, realizing that they can not sterilize and fill root canals successfully.

**Absorption of Teeth in Dermoid Cysts. E. Marthaler. Inaugural Dissertation, Zurich, 1919.**

The occurrence of teeth outside of the buccal cavity, aside from teeth retained in the jaw, is not of much practical importance for the dentist, but considerable scientific interest is attached to this question. Such teeth are found most frequently in dermoid cysts, and among these especially in ovarian dermoids; the literature contains records of a large number of tooth-bearing cysts. The structure of these teeth, when fully developed, differs in no way from the structure of the teeth in the mouth cavity. Anomalies in form, enormous variations in number and size, anomalies in position and eruption have been demonstrated. Histologically these variegated toothlike structures present a variable degree of development. For the most part, these teeth are solidly wedged into a bony base, although some are found floating free in the cyst fluid. As a rule, a normal pulp is present; more rarely, the pulp is imperfectly developed, and very exceptionally it is altogether absent. Teeth of the first, as well as the second dentition have been met with in dermoid cysts.

It is a remarkable fact that in a number of these teeth, destructive lesions and excavations have been found, which are often strongly suggestive of the appearance of diseased teeth. Up to the present time, with few exceptions, all cavities in teeth in dermoid cysts were simply designated as caries. However, the author's examination of a case of excavated teeth from a dermoid cyst has established the fact of the condition being due, not to caries, but to absorption.

This statement is based on the following considerations: (a) No zone-formation is demonstrable in the decalcification; (b) The cavities contain innumerable absorptive lacuna which are entirely uniform with the lacuna seen in the absorption of the milk teeth and the permanent teeth in the mouth.

Finally, microorganisms are altogether absent in or around the cavities. The pathologic changes are accordingly produced by way of internal properties on the part of the teeth, instead of external causes of disease such as bacteria. The existing cavities were evidently the result of absorption, not of caries. The characteristic absorption lacuna were distinctly demonstrable in all the hard dental substances. The absorption in this particular instance undoubtedly originated from the outside, from the elastic tissue covering the teeth, instead of from the pulp tissue; for a communication between the latter and the cavities was either entirely absent, or so minute in proportion to the defect as to indicate the probable origin of the defect from within.

**Effect of Feeding with Oats on the Tongue of Rats.** K. Secher, *Hospitals-tidende*, 1918, No. 43.

When rats are fed for some months exclusively with oats, inflammatory tumors make their appearance on the tongue of these animals, caused by the fine hairs attached to the husks of the oats. This experiment was originally performed by Stahr, who was unable, however, to repeat it successfully. The author, on the contrary, had positive results and was enabled to confirm the observations of his predecessor, in every detail, macroscopically, as well as microscopically. He likewise arrived at the conclusion that this inflammatory tumor, although its checkered epithelial proliferations are extremely suggestive of a carcinoma, must be interpreted on inspection of serial sections as a simple inflammation. The process heals as soon as another, nonirritative, diet is adopted. On the other hand, one of his rats died of a genuine undoubted carcinoma after the feeding with oats had been stopped. The tumor is interpreted by him, not as a simple continuation or advanced stage of the inflammation, but as a complication of the inflammatory process. In view of the fact that only one of the sixty laboratory animals was attacked by carcinoma, the existence of an individual predisposition would seem to be involved.

**Treatment of Trismus During Sleep.** T. Morineau. *La Restauration Maxillo-Faciale*, 1919, iii, No. 1, p. 43.

The author discusses the treatment during sleep, of persistent locking of the jaws. Some of these patients are in no hurry to be cured, and it is essential to a successful outcome that their conscious or subconscious resistance be overcome by means of very gentle mechanical measures applicable during sleep, when, moreover, these measures are facilitated by muscular relaxation. The treatment devised by him consists in the patient's wearing an intrabuccal extension apparatus which exerts a force gentle and painless enough not to prevent his falling asleep, while its continuous action finally overcomes the cicatricial retraction and the muscular hypertonicity, aided by the unconsciousness of sleep with its associated muscular relaxation. While the apparatus for cor-



rections can be varied to meet individual requirements, the principles of rational mechanical and surgical treatment remain the same, and their application yields excellent results in the majority of cases. The condition is almost invariably due to psychological influences in the form of doubt and fear, engendering a strong opposition against recovery on the part of the patient, and these interferences are successfully ruled out through mechano-therapeutic treatment during sleep. The author's intra-oral apparatus works through the action of dilators in the form of rubber rings and hooks which distend the cicatricial tissue and gradually open the mouth. Once accustomed to this apparatus, patients readily go to sleep and at the end of about a month's treatment, the mouth can usually be opened spontaneously to a sufficient extent.

**What Basic Principles of Physiology Are Involved in the Destruction of Bacteria without the Destruction of Tissue Cells?** D. G. Stine. *The Dental Summary*, 1919, xxxix, No. 3, p. 199.

The author briefly discusses the sterilization of the mucous membranes of the mouth and the soft tissues about the teeth, as well as the sterilization of the field of operative invasion or diseased cavities within the tooth or in the maxillary bone; arriving at the conclusion that there is not to his knowledge any process that will kill bacteria in infected bone without destroying bone cells. Some bacteria are out of reach of any agent that does not destroy the bone coming in contact with them. Where there is suppuration of the soft tissues around the teeth, the method of Carrel-Dakin, namely, the laying open of pus pockets and irrigation with dichloramine solution, or the application of a dichloramine paste, is the only procedure he knows of that can sterilize the pus pockets and not harm normal cells. It has been proved that young tissue cells will grow in this solution and that bacteria are killed by it. Only a chlorine-liberating agent, as in the hyperchlorous or dichloramine solutions mentioned, will kill the bacteria without damaging tissue cells.

**Erythrophlein Hydrochloride as an Agent for Devitalizing the Dental Pulp.** N. Black. *British Journal of Dental Science*, 1919, lxii, No. 1, 215, p. 71.

The two outstanding features of the use of this drug for devitalization are, first, the speed of its action, and second, the minuteness of the dosage. Whereas the time required for complete action of an arsenic dressing is seven days, erythrophlein hydrochloride accomplishes about the same result in thirty-six hours. Its action is startling in its rapidity and usually free from anything more than the merest suggestion of pain. The preparation used by the author is known as throphleol, consisting of a 50 per cent solution of erythrophlein in eugenol. The employment of this preparation—which is excellent for the treatment of sensitive dentine—for pulp devitalization is indicated, in the author's opinion, in four classes of cases, as follows: (a) Shallow cavities which have produced considerable pain and, therefore, call for devitalization. (b) Pulp requiring destruction in mouths of patients so sensitive that they will permit no operative measures until the tooth is free of sensation. (c) Where drug devitalization

must be accomplished speedily. (d) Devitalization in mouths where other methods have proved unfortunate.

The technic of the employment of erythrophlein for the devitalization of pulps is similar to that carried out when arsenic is the drug used. Pulps affected by chronic inflammation react less satisfactorily to this drug as well as to arsenic, than pulps unaffected by degenerative changes. (Erythrophleum, sassy-bark, casca bark, or ordeal bark, is the bark of *Erythrophleum guineense*. The hydrochloride occurs in yellowish-white granular crystals easily soluble in water.)

**Headache Related to Oral Sepsis.** W. W. Duke. *Dominion Dental Journal*, 1919, xxix, No. 2, p. 43.

Chronic infections, especially those in the alveolar process, are relatively frequent causes of chronic headache. Defective teeth may be responsible for headache in several different ways: They may be sources of arthritis in the cervical spine, of myositis in the muscles of the neck, or of inflammatory processes in the bursæ, in the tendon sheaths, or at the points of attachment of the tendons to the skull and cervical vertebræ. All these conditions may give rise to pain in the back of the neck reflected upward over the skull. In other cases, oral sepsis may be a source of neuralgia or neuritis in many or all of the branches of the facial nerve. Occasionally, headache is a referred toothache, which may be severe enough to suggest brain tumor. Finally, an alveolar abscess may rupture into the antrum of Highmore and cause headache, with local symptoms so slight as to escape notice. Illustrative cases belonging to the first, second, and fourth groups are described by the author, in all of which relief of the long-standing headache was obtained by means of appropriate dental treatment.

**Mucus and Oral Hygiene.** L. Sim Wallace. *Medical Press*, 1919, N. S. 107, p. 179.

The author emphasizes the fact that the essential function of the oral mucus is for the hygiene of the mouth. The peculiar properties of mucus, physical as well as chemical, render it "ingeniously suited for keeping the mouth free from the undue lodgment of particles, when the foods are not converted by artificial means into some bland pap-like form which stultifies efficient mastication and negatives considerable friction." The mucus has not only the power of facilitating the removal of food particles and shreds which have been disintegrated by mastication, but it has also, under certain dietetic conditions, the property of being disintegrated and carrying its own disintegrated self away.

Instead of accepting the customary views as to the supposed function of the oral mucus in protecting the food against the acid gastric juice, the author regards it as much more probable that the thorough incorporation of food with mucus facilitates the penetration of the hydrochloric acid throughout the whole of the contents of the stomach after a meal, and he suggests that this is possibly one of the reasons why a meal of such a physical consistency as demands mastication is more quickly and satisfactorily digested than a meal of a similar nature which has been reduced to a pap-like form before it is taken into the mouth.

Physiologists, judging from the contents of their textbooks, do not yet apparently realize that oral hygiene is a physiologic process, and that all the glands opening into the mouth, together with their secretions, are specially adapted for the maintenance of oral hygiene, and that these secretions are scarcely, if at all, of importance for any other function.

**The Important Blood Vessels and Nerves Involved in Periapical Treatments and Operations.** J. F. Alcorn. *The Dental Summary*, 1919, xxxix, No. 3, p. 197.

The teeth of both jaws, the pulps, the pericementum, the periosteum, the alveolar processes, and the gum tissue receive their blood supply from the external carotid artery through the internal maxillary branch. The nerves to the same parts have their origin in the second and third divisions of the fifth cranial, the second to the maxilla, the third to the mandible. In the maxilla the molar region is supplied by the posterior dental artery from the alveolar branch of the internal maxillary, and the posterior superior dental nerve, both artery and nerve descending upon the tuberosity of the maxilla. Both split up and enter the bone through the same several foramina about 2 cm. superior and slightly posterior to the third molar. They supply the pulps and pericementum, the alveolus and buccal gum tissue in this region.

The lingual gum tissue or the posterior part of the hard palate is supplied by the anterior branch of the posterior palatine artery, and the anterior palatine nerve. Both traverse the posterior palatine canal, emerging at the posterior palatine foramen slightly less than half way to the median line and on a line with the third molars.

The superior bicuspids and the six anterior teeth are supplied by the anterior dental branches of the infraorbital artery and the middle and anterior superior dental nerve. Arteries and nerves take the same course; the infraorbital artery and nerve in the infraorbital canal slightly posterior to the infraorbital foramen, travel down the anterior wall of the antrum of Highmore to the teeth, alveolar process, and the labial gum tissue. The anterior position of the covering of the palate, or the rugæ is supplied by the internal branch of the sphenopalatine artery and the nasopalatine nerve, both emerging through the bone at the incisive foramen, just posterior to the centrals in the median line.

The mandible is supplied by the inferior dental artery and the inferior dental nerve. They enter the bone at the mandibular foramen on the internal surface of the ramus of the mandible. They supply the teeth and bone and the labial and the anterior part of the buccal gum tissue.

The buccal mucosa of the molars receives sensory nerve filaments and arterial supply from the buccal nerve and artery.

The lingual gum and the anterior lingual periosteum and alveolar process are supplied by the lingual artery and nerve given off from the inferior dental artery and nerve just before the latter enters the mandibular foramen.

With special reference to the periapical region, the author emphasizes that in youthful individuals the pulps of the teeth and the pericementum are com-

paratively large and vascular as compared to the conditions prevailing at a more advanced age, when the pericementum as a result of diminished blood-supply becomes less resistant against degenerative changes. The blood to these tissues, according to Stine, is distributed to the pericementum and by collateral circulation supplies the pulp. The nerves enter the pericementum and pulp canal by several trunks in the apical tissue.

The disposition of the arterioles in the pericementum insures nutrition to the peridental membrane in case of loss of apical tissue as in granuloma or apical abscess, and also insures a collateral blood supply to the pulp in case of loss of main arterial trunks, as for instance, in operations upon the inferior dental or infraorbital canal, in which case the pulps do not die.

**Common Salt and Erosion: A Thesis. G. F. H. Bloom. British Dental Journal, 1919, xl, No. 8, p. 305.**

Attention is called by the author to the fact that erosion has never been observed in primitive tribes in parts far removed from salt deposit or sea shores, where salt is not added to the diet. Common salt is not necessary to healthy existence in larger quantities than the percentage of natural salts in fresh fruits or vegetables. It is the largest chlorine builder in the diet. During the assimilation of salty foods the salivary content of chlorine is increased. The nascent hydrogen found in the mouth rapidly unites with the dissociated chlorine to form hydrochloric acid. The normal amount of hydrochloric acid present is increased in ratio to the amount of salt consumed. Patients with erosion show an unusual liking for salt or salty foods, and a real relationship exists between the condition of the erosion and the amount of salt consumed. Common salt is as direct a factor in the etiology of erosion as friction. To the palliative and preventive treatment of erosion should be added the strict limitation of salt either in cured foods or as table addition. The presence of hydrochloric acid in the mouth constitutes a tendency to softening of the dental tissues, which aided by vigorous mechanical agents, conduces towards the production of the striking lesion observed in erosion. Its stimulating properties account for the extreme sensibility of the dentine and cementum occasioned by the chronic irritation of the minute nerve-endings.

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## EDITORIALS

### New Orleans and the National Dental Meeting

NEW ORLEANS always has been light-hearted and gay and even in this cycle of industry when all the world is scrambling to forge ahead, the Crescent City still has a moment in which to entertain the strangers within her gates. To the delegates attending the National Dental Convention, New Orleans renews her pledge to make their visit long to be remembered. During the time, business slacks, the visitors are assured a pleasurable time.

Never too hot, never too cold is a good way to describe the climate of New Orleans. Surrounded on three sides by water, the city enjoys a mild, moist brand of weather. In October the temperature lurks between a light chill and an Indian summer warmth and records show this month has a high average in the sunshine column. July is normally the warmest month and the average

yearly mean temperature for forty-six years is 55.6°. Only seven days in forty-three years have seen the mercury rise over 100, a record hard to touch.

This climate makes it possible to enjoy outdoor sports the year 'round. This is why New Orleans boasts a winter baseball league and games are played in December and January. New Orleans offers such sports as fishing; duck and snipe shooting in the marsh lands; tennis; golf; swimming; yachting; motor-boating; motoring the year 'round; horse racing; a galaxy of theatres, and the famous French Opera during the winter months. Under such weather conditions, visiting dentists may feel reasonably sure of conducting their golf tournament without interruption.

New Orleans is the greatest sea food market in the world, and for this reason the sport of fishing is unsurpassed in the lakes and bayous surrounding the city. Every variety of game and food fish abounds and a day of fishing in these waters will linger in the archives of memory.

The Metropolis of the South is primarily a city of fashionable clubs, fraternities and homes. The clubs include the Boston, the Pickwick, the Chess, Checkers and Whist, Southern Yacht Club, Country Club, Round Table Club, Audubon Golf Club, and the Louisiana Club. All of these have homes which will be thrown open to the visitors. The Elks have the finest club house in all Elksdom and it will be open to the visitors. The Shriners have just built a magnificent mosque and the Masons have a building in keeping with their national standard. The Knights of Columbus also occupy a prominent place among the lodges.

And, of course, there is always the French Quarter in which visitors may find the lights and shadows of yesterday—a truly wonderful place in which one might spend weeks without seeing everything. There is, however, quite enough within a stone's throw of Canal Street to excite the curiosity of the most blasé.

A trip along the River front will prove most enjoyable and it is almost certain that the Entertainment Committee will arrange something of this nature, there being several sight-seeing steamers docked here at all times. New Orleans has the greatest inner harbor in the world with 41 miles of frontage at which 80 ocean-going ships may berth at once. This includes the Inner Harbor Navigation Canal, linking the river and Lake Ponchartrain with a lock-level channel 30 feet deep, six miles long and which connects all railroads and steamship lines. Port facilities valued at \$13,551,206 include steel sheds and docks covering nearly eight miles with 4,478,000 feet of covered floor space.

New Orleans has just completed a \$15,000,000 army supply base warehouse of concrete construction—one of the greatest building projects in the history of the South. The warehouse covers 48 acres and has three units of the same design, each 140 by 600 feet, six stories high, with a two-story steel and pile wharf and warehouse 140 by 2,000 feet. Eight ships can be loaded simultaneously at this wharf.

Other sights to be seen include the Chalmette Battlefield, the American Sugar Refinery, the largest single unit plant in the world, the largest mahogany manufacturing factory in the world, the great municipal grain elevator and ninety-four parks with a total area of 905 acres.

New Orleans has seven Class "A" Hotels, which include the St. Charles, Grunewald, Monteleone, Lafayette, De Soto, Cosmopolitan and the Planters.

## Preliminary Announcement of the 1919 Program of the National Dental Association, New Orleans, La., October 20-24, 1919

### PROGRAM OF THE SECTION ON ORTHODONTIA AND PERIODONTIA

*New Orleans, La., October 20-24, 1919*

*Tuesday Afternoon, 2:00 P. M.*

"An Analysis of the Various Principles of Orthodontic Treatment that have been Advocated during the Last Fifteen Years."

By J. A. Cameron Hoggan.....

..... Richmond, Va.  
"Necessity for Oral Prophylaxis and Radiology in the Practice of Orthodontia."

By F. M. Casto.....Cleveland, Ohio  
"Observations upon the More Recent Developments in Periodontology."

By Arthur H. Merritt.....

.....New York, N. Y.  
"Why the Field of Prophylaxis is Marked with a Lack of Enthusiasm."

By Dorothea A. Howes.....

.....Washington, D. C.

*Wednesday Morning, 9:00 A. M.*

"Plurality in Etiology of Periodontoclasia."

By John O. McCall....Buffalo, N. Y.

"What to Extract, and What Not to Extract with Reference to Infections Involving the Periodontal Membrane."

By Louis D. Corriell..Baltimore, Md.

"An Analysis of Case Characteristics with Reference to the Selection of the Most Efficient Form of Appliance for Treatment."

By A. H. Ketcham.....Denver, Colo.

"The Problem of Retention."

By C. A. Hawley..Washington, D. C.

### PROGRAM OF THE SECTION ON OPERATIVE DENTISTRY, MATERIA MEDICA AND THERAPEUTICS

*New Orleans, La., October 20-24, 1919*

#### FIRST SESSION

"The Prevention of Chronic Mouth Infection."

(Illustrated with stereopticon slides.)

By Arthur D. Black.....Chicago, Ill.

Abst.—This paper will consider briefly the pathological changes which occur in cases of chronic alveolar abscess and chronic pericementitis, and will then discuss the causes and take up in detail the methods to be employed in operative dentistry for their prevention. Extensive studies of radiographs of root fillings will be reported, and means of simplifying pulp treatment and root-canal technique will be presented. Particular stress will be laid upon improvements in operative procedures to prevent periodontal infection.

Discussed by

H. E. Friesell.....Pittsburgh, Pa.

A. H. Hipple.....Omaha, Neb.

"X-Ray in Dental Practice."

By C. Edmund Kells.....

.....New Orleans, La.

Discussed by

H. B. Tileston.....Louisville, Ky.

Howard R. Raper, Albuquerque, N. M.

#### SECOND SESSION.

"Some Recommendations for the Sterilization and Filling of Infected Roots."

By Weston A. Price....Cleveland, O.

Discussed by

Clarence J. Grieves....Baltimore, Md.

Percy R. Howe.....Boston, Mass.

"The Gold Inlay."

By R. H. Volland....Iowa City, Iowa

Discussed by

Wallace Wood.....New Orleans, La.

W. L. Fickes.....Pittsburgh, Pa.

### PROGRAM OF THE SECTION ON HISTOLOGY, PHYSIOLOGY, PATHOLOGY, BACTERIOLOGY AND CHEMISTRY—RESEARCH

*New Orleans, La., October 20-24, 1919*

#### FIRST SESSION

"How Mouth Infection Affects the Kidneys."

By Thomas B. Hartzell.....

.....Minneapolis, Minn.

"A Phase of Dental Caries."

By Percy R. Howe... Boston, Mass.

"A Biochemical Study of Bacterial Metabolism in Its Relation to the Denser Tooth Structures."

By Samuel E. Pond... Cleveland, Ohio

SECOND SESSION

"A Dental Histo-Pathological Study."

By Harold Box..... Toronto, Canada

"Physiology and Pathology of Special Interest to Dentists."

By J. J. Sarrazin... New Orleans, La.

"Studies of the Variations in Susceptibility to the (so-called) Rheumatic Group Lesions and to the Influence of Oral Focal Infections."

By Weston A. Price... Cleveland, Ohio

PROGRAM OF THE SECTION ON  
PROSTHETIC DENTISTRY AND  
CROWN AND BRIDGE WORK

New Orleans, La., October 20-24, 1919

*Special Announcement*

Owing to the fact that only two half day sessions can be given to this Section, it has been deemed best to dispense with long exhaustive general papers and discussions, as more definite information can be given by selecting men to cover as many of the vital phases of this branch of dentistry as possible, with a view to standardizing technical procedure. The audience will thus individually have the opportunity of either accepting or rejecting the teachings of the essayists.

In addition to the papers and illustrations, the essayists will give individual clinics in order that those who desire to meet and discuss details further with the clinicians may have this opportunity.

FIRST SESSION

*Prosthodontia*

"Scientific Interpretation of Muscular Control of Mandibular Movements."

By George H. Wilson... Cleveland, O.

Syn.—The dental profession and anatomists generally are not clear on this subject. Dr. Wilson has been doing research work along this line for some years, and is now ready to present his

findings to the profession. Owing to the importance of this subject in its relation to denture construction we are fortunate to have it presented to us by a man of Dr. Wilson's ability and experience.

"Surgical Interference for Preparation of Malformed Edentulous Mouths for Construction of Dentures."

By James P. Ruy... New York City

Syn.—Demonstrates technic, using motion pictures for removing protruding gum tissue, irregular alveolar process, and other deformities in order to simplify complicated cases by providing a firm foundation upon which to build artificial dentures that will be more efficient and more beautiful.

*Crown and Bridge Technic*

"Construction of Cast Clasps for Partial Dentures and General Consideration of Other Methods of Retention and Attachment of Vital Teeth for Removable Bridge Work."

By Louis J. Weinstein.....

..... New York City

Syn.—Mr. Weinstein's knowledge of the uses and abuses of metals used in dentistry combined with his technical experience enables him to present us with definite information on a subject of vital importance at this time.

"Porcelain Jac' et Crown Technic."

By A. L. Legro..... Detroit, Mich.

Syn.—Demonstrates a definite technic for making this most esthetic, as well as most valuable prosthetic restoration for the conservation of the dental pulp comparatively simple.

SECOND SESSION

*Prosthodontia*

"Selection of Artificial Teeth for Prosthetic Restorations."

By P. C. Lowery..... Detroit, Mich.

Syn.—Clearly demonstrates one of the most important phases of dentistry which a large majority of dentists do not seem to appreciate as much as they should. The doctor shows that it is much simpler to harmonize tooth and face form than it is to adapt the face of your patients to your ideal tooth form.

"Correction of Malocclusion in Artificial Dentures."

By M. M. House.... Indianapolis, Ind.



Syn.—Demonstrates with precision the highest type of efficiency in artificial dentures.

*Crown and Bridge Technic."*

"The Gold Shoulder Crown Technic."

By Wm. H. Elliott.....Detroit, Mich.

Syn.—This technic of the most widely used restoration in dentistry is definite, accurate, and simple.

"Attachments for Veneer Teeth in Fixed Bridge Work."

By Forrest H. Orton..St. Paul, Minn.

(Dr. Orton's reputation as a technician and teacher of teachable technic is so great that no dentist can afford to miss an opportunity to hear him lecture.)

"Mandibular Movements and the Forms of Artificial Bicuspid and Molars Necessitated Thereby."

By Prof. Alfred Gysi.....

.....Zurich, Switzerland

"Mandibular Control."

By J. Leon Williams, New York City

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PROGRAM OF THE SECTION ON  
ORAL SURGERY, EXODONTIA  
AND ANESTHESIA

*New Orleans, La., October 20-24, 1919*

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FIRST SESSION

Symposium: "Apicoectomy."

"Its Indications and Contraindications and Root-Canal Technic."

(Illustrated with stereopticon slides.)

By Thomas B. Hartzell.....

.....Minneapolis, Minn.

"Surgical Technic of Apicoectomy."

(Illustrated with stereopticon slides.)

By Chalmers J. Lyons.....

.....Ann Arbor, Mich.

Discussed by

Thomas P. Hinman.....Atlanta, Ga.

William L. Shearer....Omaha, Nebr.

Carl D. Lucas.....Indianapolis, Ind.

Clarence J. Grieves....Baltimore, Md.

H. A. Maves.....Minneapolis, Minn.

"Nitrous Oxid-Oxygen Anesthesia in Oral Surgery and Dentistry."

By J. A. Heidbrink.....

.....Minneapolis, Minn.

Discussed by

Wm. H. Deford....Des Moines, Iowa

John W. Seybold.....Denver, Colo.

Boyd S. Gardner....Rochester, Minn.

"Tic douloureux—Etiology—Diagnosis

—Treatment—Palliative—Blocking

and Surgical."

By Rudolph Matas (M. D.).....

.....New Orleans, La.

Discussed by

Herbert A. Potts.....Chicago, Ill.

SECOND SESSION

"Impacted Lower Third Molar."

(Illustrated.)

By George B. Winter..St. Louis, Mo.

Discussed by

J. P. Henahan.....Cleveland, O.

Harry W. Allen....Kansas City, Mo.

O. T. Dean.....Seattle, Wash.

Roy S. Hopkinson..Milwaukee, Wis.

Symposium: "Block Anesthesia."

"Preparation of Solution."

By E. A. Litchfield..Humboldt, Nebr.

"Pharmacology of Various Local Anesthetics."

By Samuel L. Silverman.....

.....Atlanta, Ga.

"Indications and Contraindications."

By Fred F. Molt.....Chicago, Ill.

"Technic of Blocking."

(Most Important Injections.)

By .....

"Suggestive Therapy and Treatment of Abnormal Conditions During and Following Injections."

By P. G. Puterbaugh....Chicago, Ill.

"Diseases of the Antrum."

(Illustrated with stereopticon slides.)

By Charles H. Oakman, Detroit, Mich.

Discussed by

R. Boyd Bogle.....Nashville, Tenn.

Truman W. Brophy.....Chicago, Ill.

# The International Journal of Orthodontia and Oral Surgery

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## ORIGINAL ARTICLES

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### TEACHING OUR PATIENTS TO OVERCOME UNDESIRABLE MUSCULAR HABITS\*

BY ALFRED PAUL ROGERS, D.D.S., BOSTON, MASS.

THERE are many roads to failure in the practice of orthodontia. Insufficient knowledge and lack of judgment in reference to the mechanical requirements of a given case may be considered one of the most frequent sources of failure. On the other hand, a skillful adaptation and manipulation of appliances may promise to terminate in an ideal result, so long as fixtures are operative. Unfortunately there are factors which rob the orthodontist of surety of success at this stage of treatment. If the facial muscular balance of the individual is in the least disturbed maladjustments corresponding in degree to the improper functioning of the muscles almost inevitably make their appearance. Last year it was my pleasure to read before the society a paper setting forth the principles of muscle culture under conscious guidance of the patient. The aim of that paper was to emphasize the importance of training the various facial muscles to a full performance of their functions. It has been my experience that more satisfactory results are obtained by giving proper attention to that phase of the treatment. It is my purpose in this short paper to bring before you a few suggestions that I trust may be of value when undertaking the control of muscles which may or may not be deficient in strength or tonicity, but which are nevertheless the source of orthodontic defects, and which may, if uncorrected, exert their evil influence after the skillful work of adjustment has been accomplished. The muscles which I refer to are those which are by some token influenced in their action by stimuli received from an unbalanced nervous system. The malinfluence of muscles habitually under improper control is of such a serious nature, and is so common and yet so far from being mastered by us, that I trust what I say may be understood as merely an attempt to awaken the minds of all the members of this society to the ulti-

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\*Read before the Nineteenth Annual Meeting of the American Society of Orthodontists, St. Louis, Mo., March 10, 11, 12, 1919.

mate good that may be accomplished if we all pay more heed to the problems of this nature.

It is the task of the orthodontist to familiarize himself with all influences that have a bearing on his work, and his final results are a test of his diligence in acquiring this knowledge and effecting its practical application. It is not necessary at this time to attempt to enumerate all the faulty muscular actions that the muscles in and around the face are capable of assuming. It will be sufficient for each of us to call to mind some one or more of his own patients who have balked his efforts by their seeming inability to control certain muscular actions. While thus engaged it should occur to us that if we are able to teach our patients conscious control of any unruly muscle or group of muscles it will be greatly to their advantage as well as our own.

Vicious habits which endanger the permanence of our results are assuredly on the increase. Every orthodontist of experience has among his patients almost every type of child, but the most trying are those who have assumed habits which combat his skill. In helping our patients to help themselves we have a psychologic problem. It is none other than the teaching of our patients to break old and disastrous muscular habits and substitute in their places normal muscular action. In teaching conscious control of any muscle or group of muscles it will be understood that the will of the child must be so strengthened that it is able to withstand the insidious demand for wrong actions. The seat of the trouble is in the mind, and to the mind the operator must direct his attention. It will frequently be found extremely difficult to assign any reason for many of the actions which will come under his notice. In fact, the majority of these habits are exasperatingly unreasonable and therein lies a potent cause for anxiety. The actions are almost invariably found to be unconsciously performed. Some actions are slow, others are so quick as to almost deceive the eye. Some are performed during the waking hours, some during the hours of sleep. Studious children, of a not too robust constitution, are frequently found to be victims of these self-deforming habits. In a word, they seem to be an accompanying compensating evil which nature exacts of us more and more as civilization advances. It is, therefore, imperative, that we should recognize our duty in this matter if we may hope ultimately to rid our patients of their faulty muscular actions. In undertaking the treatment of these victims of habits one of the first duties of the orthodontist is to endeavor to establish a more healthy and more normal environment for his patients. Prescribe more outdoor life, more natural modes of living, greater care in selection of foods, less anxiety on the part of the parents for the extra scholastic standing by these children which is so often obtained at the cost of serious sacrifice of health by the excessive demand on their nervous energy. It means that the orthodontist must become instructor to the parent, and in undertaking this task, he must be well prepared with good and sufficient arguments to break through that irritating and unreasonable wall of scholastic ambition. Without some sort of cooperation by the parent orthodontic work requiring the correction of habit is discouraging—our efforts for the child in most cases will be of little avail. You are all familiar with the mother who upon her initial visit will tell you, in the child's hearing, that the patient is nervous and

hard to manage, etc.—little realizing that this method of parental suggestion is not only a strong factor in undermining the child's health, but is a positive factor in producing poor orthodontic results. Such parents should be instructed regarding the power of suggestion and given a few concrete examples showing what may be expected if such suggestions are continued.

One of the most important phases of this subject that the orthodontist is to remember when dealing with parents, is to remind them that negative suggestion is wrong suggestion. Show them how frequently it happens that the child brought up under negation is either docile and uninteresting or indifferent to right suggestion, or becomes positively rebellious by reason of the constant irritation consequent upon this kind of treatment. It is usually good practice when undertaking the correction of any habit to request the parents to make no reference to the habit in the hearing of the child. To leave the entire treatment in the hands of the operator. It is then essential that the child's attention be called to its abnormal performance in such a manner that it is brought to understand the nature of the habit and its consequences. Next, *there must be created within the mind of the child the conscious desire to rid itself of whatever action is proving disastrous.*

These are the first and fundamental steps, and they are not always easy of accomplishment, but after a few successful attempts the orthodontist becomes more skilled and is able to apply these principles to a greater and greater number of those who are in need. The efforts can not be intermittent, but must constitute as regular and as active a part of the treatment as the application and adjustment of appliances. They must also be accompanied by whatever methods the operator finds necessary for the building up of the health and strength of all muscular tissue surrounding the muscles involved, because teaching the conscious control of other groups of muscles will tend to develop a stronger will-power in relation to muscle work—one that will be instrumental in destroying the abnormal impulse.

On some occasions it will be found of value to drill the child on conscious control of one muscle at a time. If any group of muscles is found to be lacking in tonicity, exercises of any nature which will tend to produce a more healthy group may be employed. For instances, in the correction of the habit of mouth breathing, after adenoids and nasal obstructions have been removed, it is well to institute a general facial exercise such as the one referred to at our last meeting. Accompanying this exercise a special exercise for the orbicularis oris is often found of value. For this purpose I have constructed a small exerciser which the patient uses at home, and is shown in Fig. 1. The hard rubber parts are inserted between the lips, which the patient is directed to contract, stretching as far as possible the elastics which engage the opposite levers. Elastics may be added as the strength of the muscle increases. I have in mind a young boy who habitually held his lips apart. The lack of balance thus produced allowed a protusion of the upper incisors to take place. After a few months of effort in the strengthening of the orbicularis oris, marked improvement was seen in the position of the upper four anterior teeth, the use of appliances being unnecessary. Other instances might be mentioned where marked improvement in mandibular positions has been obtained by conscious effort of the patient himself

The evidence has been so gratifying that it prompts the belief that the more attention we give to details of this nature, the more permanent and satisfactory will be our results.

Fig. 2 represents a class of malocclusion due largely to faulty muscular action. It was discovered that this child had acquired the action by imitating a faulty act of deglutition. Fig. 3 represents the child in the act of swallowing. This photograph was taken very carefully, and is accurate in every way.



Fig. 1



Fig. 2.

An excess of muscular pressure was brought to bear upon the teeth many times a day. A digital examination of the face during this moment of contraction showed an extremely vigorous tension of the muscles involved. In fact, the pressure was so great as to overcome the influence of the lingual wire for a short time after treatment was in progress. This patient was carefully informed of the existence of the habit. The futility of further treatment was explained to her in such a manner that she was able to comprehend the seriousness of the situation. A conscious desire to rid herself of the unfortunate habit was instilled in her mind—then careful instruction and practice in the proper use of the muscles involved in the act of deglutition. Fig. 4 illustrates this same child again in the act of swallowing, but after she had practiced and learned conscious control of these muscle groups. Treatment was then continued with a fairer prospect for satisfactory completion.

Many like instances might be given you, all varying in detail, but in under-

lying principles the same. I, therefore, shall not weary you by repetition, as each of you can call to mind experiences in your own practice, but shall present just one more case which has in it a suggestion of why we sometimes fail in teaching the proper control of the pterygoid muscles. This boy had been under my care for some time and showed very satisfactory improvement in following various exercises such as were presented to you at the last meeting, but disappointment at the slowness of progress led me to inquire into the habits of



Fig. 3.



Fig. 4.



Fig. 5.

the child. I wished to place him under observation, and in order to do so I allowed him to remain in the room while treatment was given to his little sister. Being a studious lad he was under best observation while mentally absorbed. Therefore, my assistant secured for him a book, placing him at the table. It was not long before the cause of my disappointment was discovered. Fig. 5 shows

the habitual attitude of this young boy. When the father returned for the children he explained that this position was habitual at home, being the manner in which the boy usually studied or read. Many hours each day were spent in this attitude.

It will be profitable for us to grasp the idea that in our work with these little people it is not alone essential that we labor for the establishment of occlusion through mechanical means, but that we shall, with intelligence and patience, teach those under our care how they may also aid in the correction of their own difficulties by conscious, well directed actions which will result not alone in the correction of their deformities, but will fortify us against the inconvenience of the recurrence of treatment, giving us greater assurance of the permanence of the results.

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## **PRESIDENT'S ADDRESS BEFORE THE PACIFIC COAST SOCIETY OF ORTHODONTISTS, 1919**

BY B. FRANK GRAY, D.D.S., SAN FRANCISCO, CALIF.

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**T**HIS gathering of specialists in orthodontia marks the passing of another year,—a year so filled with epochal events as to all but submerge the usual serious considerations of our own relatively important work. In view of the magnitude of the world conflict we may feel our sacrifices, of whatever nature or extent, have been very fully justified. With the coming of peace, there should be inspiration to renewed endeavor, looking to the advancement of orthodontia.

### **PROGRESS IN ORTHODONTIA**

I think we have gained more during the year, in the application and working out of principles already well established than in new methods or appliances. I often wonder whether we pay enough attention to the really efficient and splendid methods at hand, gaining skill in the technical procedures necessary to their intelligent use, before we discard them only to adopt some new mechanical contrivance, with which we experiment rather aimlessly, until it in its turn, makes way for still something else. All of which brings me to my oft-repeated conclusion that orthodontia, in its very nature, is a specialty, the scientific possibilities of which may not be attained without conscientious and doggedly persistent endeavor, no matter what mechanical assistants we employ toward the end in view. While I would not discredit the importance of efficient and refined appliances, I would caution against the eternal seeking for a royal road to the attainment of results, which we can not hope to achieve without painstaking thought and intelligent labor.

I have thus, without immediate intent, drifted into an initial consideration of appliances in a general way, and I may add the suggestion that I believe each one of us will greatly benefit himself as well as his patients if he keeps constantly in view the desirability of a good technic, whatever character of appliance is used. If I speak from the standpoint of one who seeks improvement in his own work, it is none the less in the hope of inspiring in the minds of the members of this society the same desire. A good technic is vitally important

for several reasons. Good technical work is due the patient, who must wear the appliances under all sorts of circumstances. Neatness of execution of this work is appreciated by other orthodontists, as well as by the worth-while members of the dental profession who may have opportunity of seeing the patient. And if a good technic is important for these reasons, it is no less so because of its influence on the orthodontist himself. We lose respect for our own work unless we do it well. Herein lies one of the very best arguments in favor of the use of the noble metals in orthodontia. Working with base metals has little appeal to the esthetic sense of the careful operator.

Doctor Ketcham was to be present to give us further suggestions in the use of the Angle ribbon arch mechanism. Since he could not come, and because of my own personal satisfaction in their use, I wish to testify to the value of these appliances. Certainly in the form of malocclusion commonly known as infraocclusion of the molars and bicuspid, where the so-called "overbite" is much in evidence, the control that may be attained with this mechanism is most satisfactory. I am glad Dr. John R. McCoy has something to show us relative to these appliances.

#### MECHANICAL FORMULÆ

Some insistent friends of, and in, our specialty, continue to recount their convictions as to the value of "dental engineering" methods as an aid to the work of the orthodontist. It is well in considering this, as in any other subject of importance, to dissociate personality from the controversy. There is a truth about this matter. It is either useful and correct, in part or in whole, or it is not. Many of us have our personal beliefs, which may not alter the facts, whatever they happen to be. Dr. James McCoy has something to present at this meeting that may help to enlighten us.

#### RADIOGRAPHY

My experience in radiography, coupled with my work in orthodontia, causes me to believe we should be more and more insistent on complete radiographic examinations of all patients under orthodontic treatment. The congenitally missing teeth; anomalous dentition, precocious or retarded as the case may be; the serious impactions of teeth—these and other conditions multiply the difficulties of our work, and nothing so assists in clearing up the whole matter from the diagnostic standpoint, as the careful use of radiography. To ignore it is to invite needless troubles, subjecting our patients to useless delays and in the end resulting in much personal humiliation to the operator. Why shall we, therefore, not make a hard and fast rule that under no circumstances will we proceed with orthodontic treatment until the radiographic examination is made?

#### PROPHYLAXIS

I feel there was a time in the earlier years of the specialty of orthodontia when prophylaxis and its requirements at the hands of the orthodontist was a rather sensitive subject. On the one hand we were blamed for enamel etchings or decalcifications, if not absolute dental decay, when the blame was far from wholly merited. But in our eagerness for acquittal from such charges I am not sure we did not make ourselves appear all too innocent. I find it requires very



conscientious work and observation to make sure that no harm shall come to the teeth of our patients during treatment. In this connection, Dr. Dunn has spoken to me relative to the wisdom of noting carefully the condition of the teeth of the patient at the time we commence our work. Such data should be a part of the case record. Certain defects, enamel etchings, etc., due to neglect, may be noted at that time, and unless we do make such a record we may be blamed later on for conditions for which we are in no way responsible. It may be well in such cases to advise the parents of conditions as they are.

Beyond doubt we would do well in not a few cases, to insist upon careful polishing of the teeth by a competent prophylaxis specialist, before appliances are in place. At the commencement of the period of retention a still larger percentage of children would profit very much through having the services of the periodontist before the retaining bands are cemented in place. A third favorable period for such attention would be, of course, when the retaining bands are all removed.

I feel it has not been so much the orthodontist's lack of appreciation of the advantages of expert prophylactic attention to the teeth of his patients, but the financial consideration may have been an exaggerated hindrance. How unreasonable it is, however, to assume a parent who appreciates the value of orthodontia, would fail to appreciate the safeguards secured to the teeth by skillful prophylactic attention! Of course there is the responsibility on our own shoulders at every step of the work, to see that the patients' teeth are not being neglected, and it would still seem we must supplement their efforts all too often, however disagreeable it may be.

I am enlarging a bit upon the subject of prophylaxis, simply because the orthodontist occupies a position of unusual opportunity. If I understand correctly, pyorrhea has its beginnings oftentimes at a very tender age. There are certain rough enamel surfaces sometimes noticeable at the gingivæ of children's teeth, which Dr. Frederick S. McKay, of New York, tells me are most certainly the forerunners of pyorrhea alveolaris. I am sure Dr. McKay would have no lack of support in this matter from other prominent specialists in periodontia. Our practices, composed as they are of young children, offer unusual advantages of observation. Should we not be more alive to the situation and thus be able to recommend proper treatment when these conditions are present? We need to guard against a careless, one-sided method of diagnosis. While noting conditions of malocclusion, which happens to be our chief interest, let us study carefully all conditions that have to do with the health of the gingival margin. I am persuaded that many cases of inflamed and hypertrophied gums are due to roughened enamel surfaces, and not necessarily to deposits.

#### TEACHING OF ORTHODONTIA

I do not know that any special progress has been made in this department. I believe it is one of the unsolved problems. The suggestion I heard Dr. Angle make a good many years ago is still fresh in mind. He felt that an endowed institution would alone permit of the ideal facilities for carrying on the work satisfactorily and worthily. It would appear the institutions at Boston and Rochester might approximate this idea more nearly than any others now in ex-

istence. The specialty will welcome an improved method of teaching orthodontia, I am sure. With all due respect to those who have attempted teaching the subject in dental schools, it has, so far, been a laborious, unsatisfactory proposition.

#### PERIODS OF TREATMENT

We need to exercise wisdom in the matter of prolonged periods of treatment. A child may present at the age of four to seven years, with narrowed dental arches, possibly with mesio-distal inharmonies of relation between the upper and the lower. Very properly the arches may be expanded to a suitable degree, and erupting incisors guided into their right positions. At such a youthful age it would appear a tolerably brief period of retention should suffice. But all too often the retention period is not ended before some further discrepancy is noted. Presently a second period of treatment may be inaugurated: possibly the "over-bite" must have attention; maybe the root apices of the incisors must be moved labially,—there may be any one of a number of reasons for keeping the child under treatment for a few more years. I think some of our patients wear orthodontic appliances over too long a period of time. In spite of the opinion of those who think differently, I believe this subject demands careful consideration. May we not hope for some more clearly defined rationale or system along this line? It does not seem justifiable to me that a child should wear appliances from four or five years of age until twelve or fourteen. There should be some breathing spells during which the mouth may be free from all mechanical fixtures. Let us do thoroughly what is necessary for the child, whether at four or six, or at eight or ten years of age, retain the teeth a sufficient time, and then remove the appliances in their entirety. Should there be the occasion for it a year or two later, another period of treatment may be considered.

#### ETHICS

In the belief that something can be done to improve conditions, orthodontists may be prone to inaugurate new treatment periods, especially for children who have been treated by other specialists. They may be a bit thoughtless of the likelihood that the majority of their own patients, no matter how conscientiously treated, may present some discrepancies. Particularly is this true during the period of dentition, a time of great transition, of course. Leastways in dealing with parents we will do well not to discredit the efforts of other specialists. Possibly a second period of treatment, a year or so later on, was in contemplation by the first orthodontist.

#### COMPENSATIONS

In conclusion, the conscientious orthodontist gives much of himself to his chosen work. The demands of successful practice are so great that possibly the financial rewards may not be regarded as wholly commensurate with the expenditure we make in time and energy. But there are other compensations than money, and what it buys. The knowledge that we have corrected abnormal dental arches and prevented or cured facial deformities, thus contributing to the health and happiness of children and benefiting them throughout the whole of

their lives to a degree hardly possible of computation, these are considerations that should go far toward causing us to appreciate the happiness of our lot.

Again, the privilege of working for children, many of them of rare spirit and understanding, is one of the compensations we may sometimes overlook when burdened with a sense of the difficulties of our work. These little folk form a clientele, the equal of which practitioners of no other specialty may enjoy. The boys and girls whom we serve should be an unfailing source of inspiration to every orthodontist. Surely the conscientious doing of our self-allotted tasks will bring to us all necessary compensations.

#### DISCUSSION

*Dr. John R. McCoy, Los Angeles, Cal.*—Our president has certainly given us some food for thought in the splendid address which he has just presented. His desire that orthodontia of the higher type should continue to progress I am sure is shared by every one of us.

Dr. Gray brings up the matter of appliances in a most pleasing and conservative manner, emphasizing the value of efficient and refined appliances instead of taking the view of the radical who features his pet appliance as a "cure all" for every case.

For years past we have all agreed that radiography was quite an essential part of our profession, but this is really never brought home sufficiently until some day a permanent tooth fails to develop and we realize our earlier knowledge of the condition would have been most valuable. In just such an event do we "turn over a new leaf" and make our radiographic diagnosis when the case is started. In our office we have a diagram on our record cards to indicate presence, absence, or conditions of unerupted teeth recorded from a radiographic examination.

I presume that all of us have had complaints of cavities, etc., after the completion of treatment, the most of which existed before the patient was put into our care. On our record cards of which I just spoke, there is a simple diagram upon which is noted the conditions of the various teeth so that most of these unpleasant occurrences can be avoided. Of course, I believe in every possible defect of tooth surfaces being cared for before orthodontic treatment, but this is not always attended to by the parent.

There are probably several reasons why teaching orthodontia has not been successful in our colleges, one of which is the lack of interest in the subject by the student who considers orthodontia some vague problem, the solution of which is impossible for him.

The criticism of a former orthodontist's work by the man who is "retreating the case" as a rule is certainly not justified; however, I believe that most of us have brought this criticism upon ourselves by promising entirely too much when we begin the initial treatment. Some of us have been guaranteeing permanent results, forgetting that if the initial cause of the abnormality should return malocclusion will recur shortly.

I want to thank Dr. Gray for this contribution and assure him that it has put some of us to thinking.

*Dr. Allen H. Suggett, San Francisco, Cal.*—This is a most excellent paper. The reference to appliances is very apropos, for we are getting away from sectarian dentistry, as Dr. McCoy has very aptly put it, and are using more and more independence in the use of appliances. At the last meeting of the American Society of Orthodontists there was manifest a very liberal spirit in the use of appliances. Most everybody has abandoned the screw D band and is using the appliance he thinks is applicable to the case, whether it be the labial expansion arch, the lingual wire, the pin and tube, or the ribbon arch wire. There does not seem to be any lese majesté about it any more.

I find that in many cases a lingual wire is ideal, but in other cases it would be a loss of time to confine yourself to it. In many cases of distoclusion, the simplest appliance would doubtless be a lower lingual wire and upper molar bands and a labial expansion wire and Baker anchorage.

There is a tendency not only to use the appliance that seems applicable to the case in hand, but the one which that particular orthodontist can handle the most skillfully.

*Dr. Leland Carter, San Francisco, Cal.*—I believe, as Dr. McCoy has said, that Dr. Gray has indeed given us some food for thought. I was very interested in his remarks regarding radiography, also his statements relative to a thorough clinical examination before cases are started. I believe that if the radiographic and clinical examinations were adhered to more strictly, a great many mistakes would be avoided, and we would not be blamed for causing decay so often as we are at present.

So far as appliances are concerned, I believe it is a good idea to master a certain type of appliance and stay with it as long as you get results, or until you are certain that some other type is superior and will increase your efficiency. One orthodontist might be very successful with a certain type of appliance, while another might not get good results—the personal element must be taken into consideration as well as the mechanical efficiency of the appliance. If we jump around from one type to another, we will never get anywhere. We all know there are many appliances in use that work fine on paper, but—well, they are more valuable to the manufacturers than to the orthodontist.

*Dr. A. A. Solley, San Francisco, Cal.*—While I think most of us make records in regard to the tooth structure on our cards, yet, many of us are probably a little lax in making these records. It is a lax system not to have a statement whereby the orthodontist, as well as the patient, knows absolutely what the condition of the mouth was when the work was started. I believe we should go over the mouth very thoroughly and note all the work that is to be done. We should get in duplicate a record, at that time, showing what the dentist has done and have the patient sign it. The record cards should show the condition that the child's mouth was in when the work was started. In that way many difficulties that afterwards come up could be obviated.

*Dr. Gray (Closing).*—I wish to thank Dr. McCoy and the other members who have discussed my paper. Dr. McCoy and Dr. Solley have referred to the disintegration of teeth, and the idea of keeping adequate records of these conditions. Dr. Engstrom I think carries out the plan of such a complete record card, which is signed by the patient as an acknowledgment of existing conditions, fee, etc.

Referring to Dr. Suggett's remarks, we will all do well to remember the "D Band" permits of an accuracy of adaptation to certain molar teeth that can not be secured by any other band. I think that is obvious.

**SYMPOSIUM ON THE ADVISABILITY VERSUS THE INAD-  
VISABILITY OF MAINTAINING SPACES IN THE MOUTHS  
OF CHILDREN, WHERE TEETH ARE MISSING, FOR  
THE PURPOSE OF LATER INSERTING ARTI-  
FICIAL SUBSTITUTES**

DRS. BURT ABELL, D. W. FLINT, AND J. LOWE YOUNG

**No. 1. By Dr. Burt Abell, Toledo, Ohio**

**W**HEN Dr. Kemple asked me to take part in this symposium, I had a good mind to refuse, because I felt that I had no experience that was different from that of any of you, but after he said we should make it a report of cases, I told him I would do the best I could.

I am here to get help out of this discussion. I will tell you what I do and what I propose to do, and if you will tell me what you would do, I shall be grateful.



Fig. 1.



Fig. 2.



Fig. 3.

There is nothing in my practice so bad to manage as cases in which there are absent or missing teeth.

Fig. 1 is a model of a case that came to me a year or so ago. The first upper permanent molar on the right side was missing—extracted, and an attempt was made to move the second permanent molar forward to take its place. This is pertinent to the subject because wherever this can be done it is an advantage to do so. (Fig. 3 is later than Fig. 2.) When I discovered the molar was taking



Fig. 4.

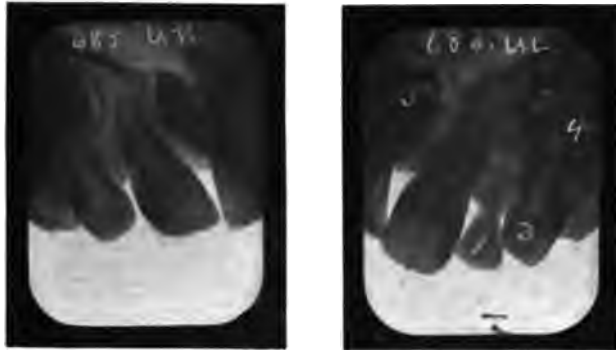


Fig. 5.



Fig. 6.



Fig. 7.

an excursion, I took a wax impression and made a study model of the case. The point I want to bring out here is, is it possible to make that upper second molar take the place of the first permanent molar and make it stay there. (It appears to be making the attempt to resume its old position.) I think it is a crime to put in an artificial tooth if we can possibly avoid it, in children.

In Case 683 (Fig. 4) the lateral is missing. The one showing is temporary.

Nature has tried to do the proper thing by moving all the upper teeth forward, and I am going to leave this arrangement of teeth as near as I can and make the mesiobuccal cusp of molar take the place of the second bicuspid and use the cuspids as laterals rather than put in artificial substitutes of any kind. In Fig. 5 I have had the photographer arrange the films so that you are facing the model. There is a supernumerary which does not enter into consideration of this case and was extracted. Notice the permanent laterals are absent. Is there any better treatment than I have outlined?

Fig. 6 is a case which proves we need to make extensive x-ray examinations where temporary teeth are present. This upper second bicuspid came into place and adjustment was made of the molars and the other teeth. I got fairly normal occlusion with the lower temporary tooth in position. I waited and waited for that temporary tooth to be discarded, but I finally became alarmed about it, and Fig. 7 shows what I found on x-ray examination. Please remember the good condition of the temporary tooth at first. If I had known the permanent tooth was missing, I could have saved the temporary tooth by exercising some care and retained it for a long time. This is my report to you with the S.O.S. call.

## **No. 2. By Dr. D. W. Flint, Pittsburgh, Pa.**

Did you ever hear the expression, "I never thought of that?" It just so happened years ago that one day J. Lowe Young was visiting in my office when I was about to treat a case in the usual way where the lower left first molar had been prematurely lost, with the characteristic conditions, apparent protrusion in the upper arch, retraction in the lower anterior region with a forward, downward, inward tipping of the second molar.

He suggested that I bring the second molar forward, which I did with very gratifying results. The third molar erupted at the age of sixteen and took its place in good shape.

Well, this was the first breaking away from dogmatic teaching, and I suppose I have been falling from grace more or less ever since.

I might say here that on several occasions I have endeavored to bring the tooth back of the space forward and failed of accomplishment when I had to resort to pushing the same back preparatory to insertion of a bridge. This is my practice, first to try and close the spaces, and if the osseous conditions are such that I can not deliver, then I resort to our first teaching, this, of course, applying to the loss of the six year molar.

When a lower lateral or central is congenitally absent I have practiced both ways, but you will find a heap of common sense among our patients, and to hear testimony from their own lips, they would rather have a slight rotation of some of the upper incisors, owing to the extra amount of tooth substance, than to be inflicted with bridge work or artificial substitutes in any form all their days, and I heartily agree with them. I would not now open up a space in the lower incisor region.

It is a calamity when a patient is handicapped by the failure of nature to give the allotted number of teeth, but they will live through it, even if we are very much perplexed as to our plan of procedure. The fact is, our work is only difficult as we have mutilations in any form, and here is where we need all the knowledge we can command.

I want to report on one case of a boy, eleven years of age. A lower first bicuspid had made its appearance, but stayed stationary for six months, when upon x-ray examination it was found to be full of pus with a large area at the apex. This tooth was taken out and in five months his second bicuspid and both molars were brought forward perfectly. I have with me the models of the case. This to my way of thinking was a really worth while operation, and it opens a field, a new field, in this day, when we are hearing so much and are having such bad reports of rarefied areas.

The laterals are quite often missing. I am in that boat myself, but I would rather be shy than have the best artificial substitutes that I know anything about. I know of one case where the spaces were opened up and for a mature man substitutes supplied, and the facial appearance was simply awful.

For girls, in the anterior part of the mouth, I will say that I have not been disappointed in a single case when I have opened up the space and replaced with a dummy. I have one lateral being carried by a very stiff iridio-platinum band, and in twelve years the same has not even become uncemented. This same case the dentist refuses to take off as in his judgment it is a much better piece of bridge work than he could offer; the color, the shape of the tooth, and all being so satisfactory, and yet the same was only placed as a temporary piece of work.

I doubt whether a rigid rule can be laid down for any one's guidance in the matter of when to and when not to open up spaces, and we must use common sense and all the light we can get to govern ourselves, and then after we have done our best, let the other fellow worry if there is to be any.

### **No. 3. By Dr. J. Lowe Young, New York City**

We can not put too much emphasis on the fact that the best results from an orthodontic standpoint can not be obtained unless the full complement of teeth are present. This topic deals with cases where teeth have been lost or are congenitally absent. It has been my good fortune to have had but few cases of children mutilated by the exodontist, but many cases have been treated where the teeth were congenitally absent. Many adult cases have been treated that were mutilated.

In this article "missing teeth" refers to those which are congenitally absent and "lost teeth" to those which have been extracted. This subject may, therefore, be divided into three parts: First, those under fifteen years of age with teeth missing; second, those under fifteen years of age with teeth lost; and third, those over fifteen years of age with teeth missing or lost. It formerly was thought that the upper lateral incisors were the most liable to be missing from the permanent set, but careful observation has proved this to be erroneous. My records show the lower second premolar missing more often than any other tooth from the permanent set. The number of teeth found missing ranges from one to many. The greatest number of missing teeth I have encountered is seventeen.

In the treatment of mixed dentures it is advisable to have x-ray pictures of all deciduous teeth areas to determine whether their permanent successors are present. When the x-ray shows that not more than four permanent teeth are missing and the roots of the deciduous ones are not resorbed, it is deemed good policy to preserve the deciduous teeth as long as possible. If, however, the roots of the





Fig. 1.—Shows cast of a girl of twelve with the right upper canine erupting over the deciduous molars. Some years previous this child had an infected antrum and the surgeon who opened into it from the mouth removed the developing premolars and caused the death of the pulp of the canine. The x-ray substantiated this history.



Fig. 2.—Shows the cast of the same case. The permanent canine being removed allowing the deciduous canines and molars on the right side to remain.

deciduous teeth are resorbed to any great extent (and they do resorb even though the permanent successors are missing) another method of treatment might be resorted to. I have never seen the upper deciduous laterals in place with good roots where the permanent ones are missing, but have frequently seen deciduous canines with roots showing little or no resorption—the permanent canines erupting either mesial or distal to the deciduous ones.

*Part I.*—In treating children under fifteen years of age with missing teeth we must be guided by the number of teeth missing. If but one upper lateral is

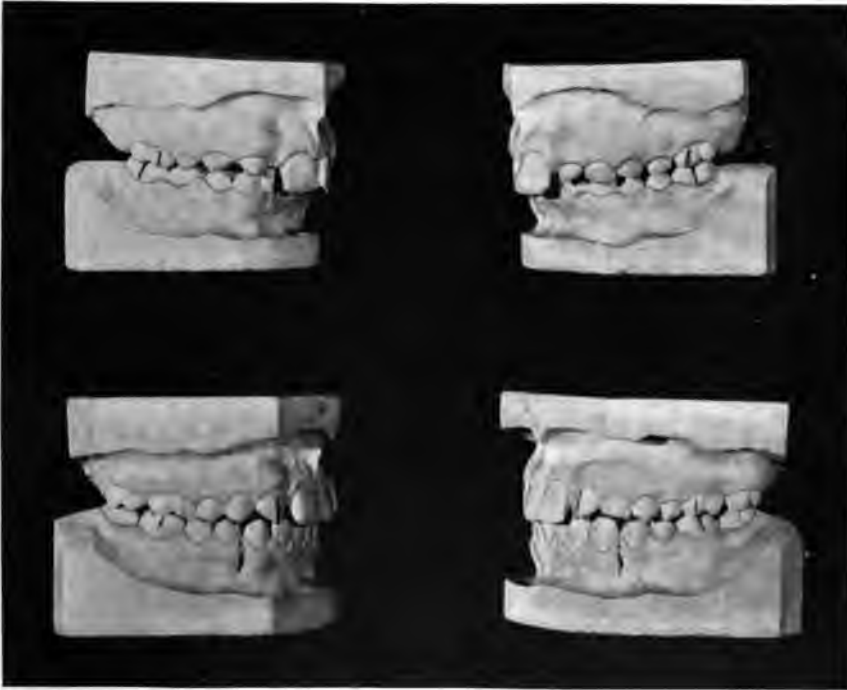


Fig. 3.—Shows casts before and after treatment of a girl of twelve. Permanent upper laterals missing, left deciduous canines still in place.



Fig. 4.—Front view of Fig. 3 before and after treatment.

missing and the deciduous canine has a good root, I would treat the case as though the full complement of teeth were present, permitting the deciduous canine to compensate for the missing lateral for I have seen this tooth in the mouth as late as forty years of age and while it is true that it is not the same shape as the lateral and that it becomes an entirely different shade from the permanent teeth, I would still consider it better policy to retain it, for we must not lose sight of the fact that the laity do not observe teeth as critically as do dentists and orthodontists. In like manner would I treat a case with both upper laterals missing and the deciduous canines having good roots.



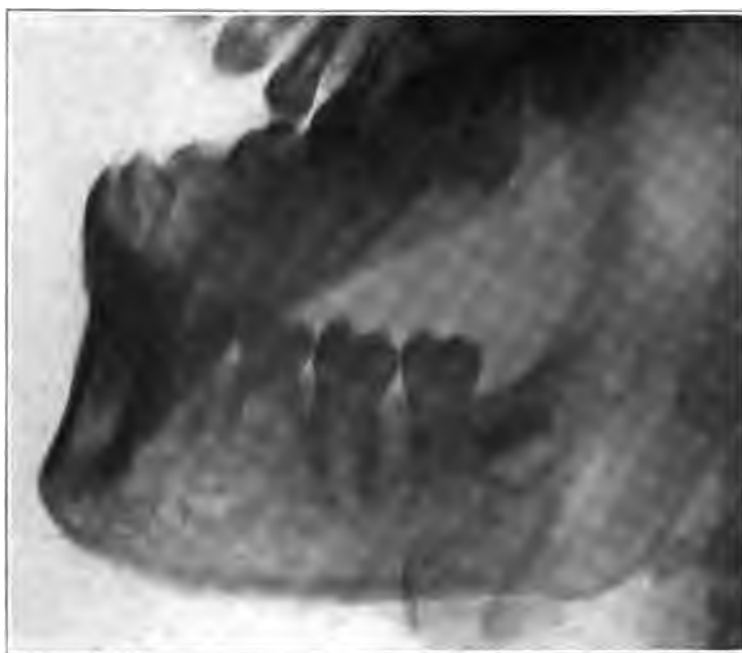
Fig. 5.—Casts of girl of seven and one-half with one upper lateral missing.



Fig. 6.—After treatment of this case which is unsatisfactory owing to deep overbite.

Where the upper lateral is missing and the deciduous canine is lost, I would then advise the placing of the canine in contact with the central and the moving of all the upper teeth on that side forward, which, of course, necessitates establishing a malocclusion on one side, but if carefully done and then by slightly grinding the cusps of the premolars and molar teeth a very efficient occlusion can be obtained. Where both upper laterals are missing and the deciduous canines are lost, the same method of treatment would be pursued, establishing a malocclusion on each side.

Where the second premolars are missing and their deciduous successors lost or their roots resorbed, I advise the moving forward of the first permanent molars.



**Fig. 7.**



**Fig. 8**

**Figs. 7 and 8.**—Made from x-ray plates taken extra-orally of the mandible of a child of eleven showing the second lower premolars missing and the third molar present. In such cases I advise the removal of the deciduous molars and carrying the permanent molars forward so as to close the space.



Fig. 9.



Fig. 10.

Figs. 9 and 10.—Pictures of a child nine and a half. While the third molars are not clearly shown the roots of the second deciduous molars are so resorbed that I would advise their removal and treatment as in the preceding case.



Fig. 11.



Fig. 12.

Figs. 11 and 12.—X-ray plates of a boy of eleven, the lower first permanent molars having been removed. In this case I then advise the carrying forward and straightening up of the second molars thus establishing a malocclusion and a compromise treatment.

placing them in contact with the first premolars. This would be done regardless of the number of second premolars missing. Where more than four premolars are missing and the deciduous teeth lost or their roots badly resorbed, I then deem it advisable to provide for the full complement of teeth as much as I regret the necessity for a child to be compelled to go through life with artificial teeth.

In the case of missing lower incisors, if but one or two are missing, the same course might be followed as where the upper laterals were missing, but I have never seen the deciduous canines retained in these cases and I have never treated one in this way. I recall two cases where I have maintained a place for the miss-



Fig. 13.



Fig. 14-A.



Fig. 14-B.

Figs. 13 and 14.—Casts of a girl of sixteen, showing the 15 permanent teeth in the mouth. Three of the lower incisors being deciduous ones, the second deciduous molars being present both upper and lower. X-rays showed there were no teeth to erupt. This is the most pronounced case of missing teeth I have ever encountered.

ing incisor, but in our present light of the baneful effects of supplying missing teeth I would advise the other method of treatment. Where more than two lower incisors are missing it then becomes necessary to maintain the spaces for the full complement of teeth. I have never seen a case with a missing canine.

*Part II.*—The tooth usually lost in children under fifteen years of age is the first permanent molar, and the lower more often than the upper. In such cases it is deemed advisable to have x-ray plates made extra-orally so as to determine whether the third molars are present, and if so, impacted or otherwise. Where present and not impacted, it is deemed advisable to move the second per-



Fig. 15.—Casts of a woman of twenty-five with the lower first molars removed and a deep overbite. Class II malocclusion.



Fig. 16.—A study model of the case described above during treatment, opening up the space for the first molars.

manent molar forward, placing it in contact with the second premolar unless the incisal overbite is so pronounced as to render this inadvisable. This method I would pursue where one or more first molar is missing, and would consider it good practice where one was missing to remove its mate on the opposite side if the pulp had been lost from it.

In the case of lost upper first molars I would advocate this method of treatment even if there were a pronounced overbite in the incisal region.

*Part III.*—In patients over fifteen years of age with missing or lost teeth most of my work has been the treatment of cases with lost teeth. One case at



nineteen with one upper lateral missing was treated by removing the lower premolar, thus compensating for the missing tooth in the upper arch, and this I might say is the only case in my entire practice where I have removed a permanent tooth for the treatment of malocclusion. Careful observation will prove to any one that wherever the first permanent molar is lost the tooth distal to it tips forward and rotates lingually. This permits the corresponding tooth in the opposing arch to drift buccally and elongate, thus rendering it impossible to properly sup-

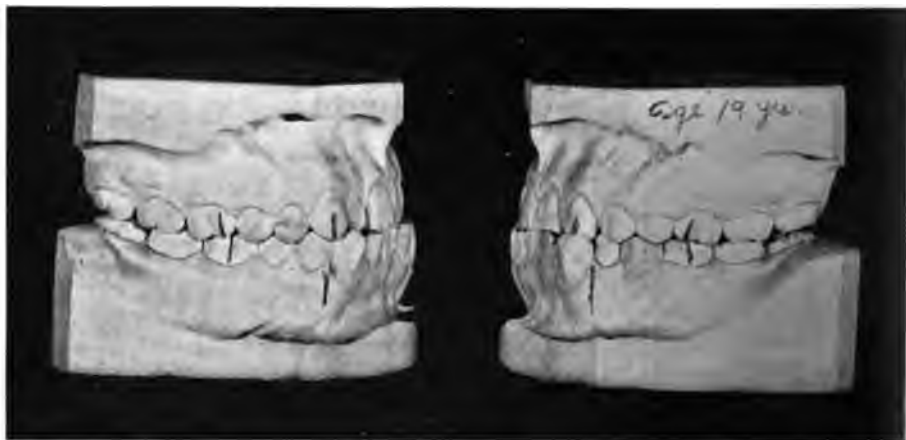


Fig. 17.—Casts of a young man of nineteen, the left upper lateral missing and the right lateral of diminutive size. It was decided to remove the lower left premolar and thus obviate the wearing of artificial teeth.

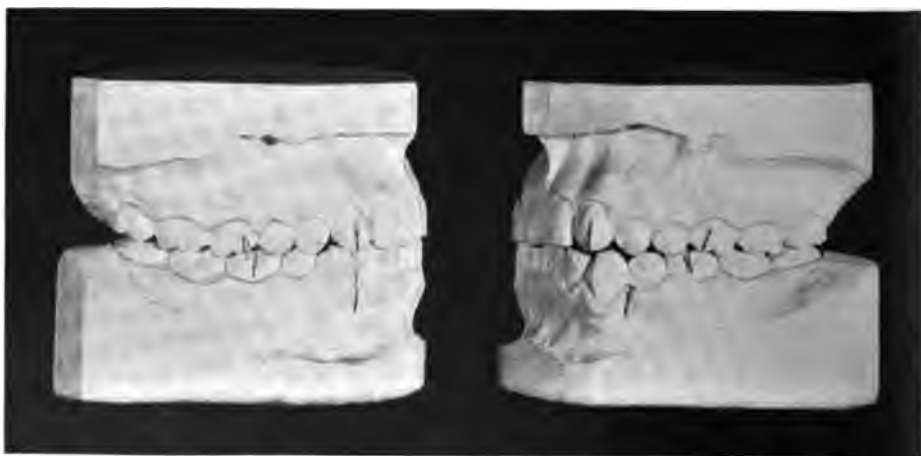


Fig. 18.—Shows the result with a porcelain jacket on the diminutive lateral and the canine and second molar in contact on the lower left.

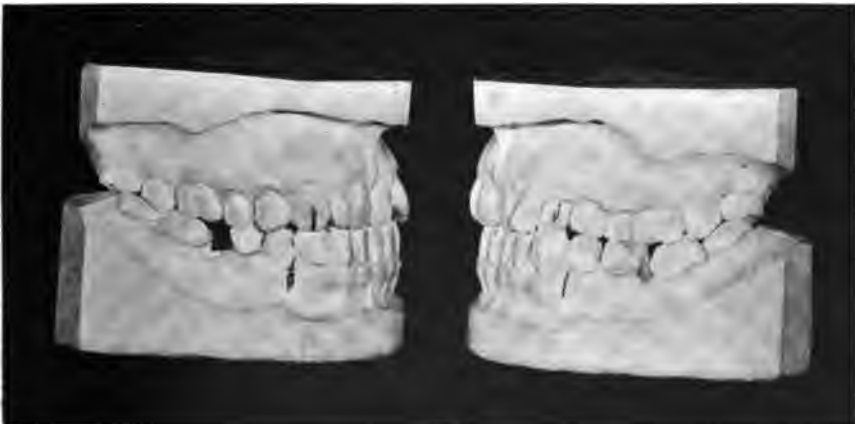
ply the missing tooth by any method. In such cases I would advise the straightening up of the tipped second molar in one of two ways: where the overbite in the incisal region is deep the second molar should be placed in its proper position and the upper molar depressed in its socket so as to establish the proper plane of occlusion so that the artificial tooth can be substituted for the lost one. Where the overbite is shallow the second molars can be carried forward and straightened up, thus obviating the necessity of an artificial substitute.



**Fig. 19.**—Made from casts of a girl of twenty-one with upper laterals missing. It was decided not to open up spaces for these teeth.



**Fig. 20.**—Shows the result of treatment.



**Fig. 21.**—Casts of a woman of forty-four with lower first molars extracted; very slight overbite. In this case the lower molars are being carried forward, obviating the necessity of bridge work.

## **DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA**

Under Editorial Supervision of

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### **AN OPERATION FOR AN UNERUPTED TOOTH AND THE RESTORATION OF THE PARTS BY ARTIFICIAL DENTURE, WITH PRESENTATION OF A CASE\***

BY ANDREW G. FRIEDRICHS, M.D., NEW ORLEANS, LA.

**C**OLORED female, age thirty, married, with two children, about two years ago began suffering with a severe pain about the face; this was followed with a swelling of the face on the left side, the pain continuing all the time. When the patient presented herself to me I found a dense, hard, bony mass; the growth was slow. Upon examining the mouth I found an abscessed tooth and concluded that the swelling was due to this abscess. The tooth was extracted. I thought this would have explained the condition. The socket was curetted and the abscess drained. The patient was discharged and I thought that the trouble would be relieved. She came back a few weeks later, with no improvement in her condition; the pain still very severe, especially at night.

I might mention that I had an x-ray picture taken before I extracted the tooth, as it is my custom never to proceed with any unusual condition without one. The skiagraph gave no indication of anything unusual. I made a further investigation and found the swelling to be an enlargement of the bone. I then concluded that it might be an odontoma adamantigerous cyst, as both the bicuspid and cuspid were missing and in the arch, and had not been erupted. I had another skiagraph taken, with no better result than the first. The patient complained so much that it was necessary for me to make an attempt to relieve her. I concluded that I would chisel into the bony mass, through the alveolar process and superior maxillary bone. I found the bicuspid tooth embedded in the bone. Position of the crown: The lower part at about the ala of the nose, extending upward towards the inner canthus of the eye; the position of the tooth is shown in the piece of bone which has been removed. The operation was performed on

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the 25th of last February, the wound healed up, and she has been free from any discomfort since, except the loss of bone in the mouth, which left a large hole in the upper jaw. Her phonation and mastication were interfered with; she ate with difficulty and could hardly speak. Being responsible for her condition, it behooved me to make her comfortable, so I have restored the removed parts with the missing teeth by an artificial denture. Her future existence will be without trial and tribulation, as she can now phonate and masticate and swallow as well as she ever did.

One of the most surprising things about all operations on the jaw and face is the fact that the surgeon who operates seems to give very little attention to the deformities which they occasion as the result of the operation. They seem to be satisfied whenever they operate and remove the cause of the trouble; no matter what may be the resulting deformity, they consider their effort a great success. In amputation of the limbs, they would consider themselves poor surgeons if the resulting stub was not of a character to make the use of the artificial limb practicable.

You would be surprised, in operating on the jaw, how seldom it is necessary to make external incisions. I contend that whenever an operation is contemplated upon the face or jaw the resulting deformity should be considered, and the incision should be so arranged as to occasion the least disfigurement. One of the most pitiful evidences of this was a case of removal of the superior maxillary. This patient was a man of refinement. The loss of tissue occasioned such a deformity that, being a man of an extremely sensitive nature, he shrank from society, would not even go back to his family, and finally drifted to a crosstie camp. As he expressed himself, he was hardly human and was forced to eat like an animal. His phonation was difficult, he could hardly speak above a whisper, and his disfigurement was very pronounced. He came to my clinic in the hospital, suffering with a lesion from a tooth on the opposite side, with the story above related. He told me that life had become a burden to him, that he had about reached the limit of his endurance, and he did not believe that life would be worth living if his condition could not be relieved. The lost maxillary was restored by an artificial appliance, his face deformity relieved, his phonation, mastication and deglutition restored. He was a happy man.

This operation (removal of maxillary) was performed by a surgeon of prominence in Buffalo. This unfortunate man had suffered for five years before I saw him, and what appeals to me as most remarkable is the fact that this matter was allowed to go on so long, apparently unconscious that he could have obtained relief. This case occurred about twenty-five years ago. I could call attention to a great number of instances, but it would be but an iteration of the same story. You see a number of deformities walking around the streets of this city; these people must have some friend in our profession that could advise them, and, should they not be able to get the necessary attention anywhere else, at least send them to the Charity Hospital.

The literature of the profession is full of the many wonderful restorations of lost parts and in relieving the mutilations occasioned by injuries in this war. Even if you have not read about them you could not help but hear of them, so there can hardly be any reason why such conditions could exist with the present lights before us.

## DISCUSSION

*Dr. Provosty.*—Emphasizing the necessity of having such pictures taken correctly, I would recite a case occurring some years ago in my service at the Charity Hospital. A young woman had come in with an enormous tumor of the upper jaw. On inspection I made a diagnosis of sarcoma, and the x-ray taken at the Charity Hospital confirmed the diagnosis. I was unwilling to do a disfiguring operation without better evidence of the existing condition. I had a picture taken again outside of the hospital, and the new picture showed an enormous tooth in the antrum, which was removed, and the patient recovered rapidly without disfigurement.

*Dr. Gessner.*—I should like Dr. Friedrichs to explain why the impacted tooth did not show in the skiagraph he had taken. Further, I should like to know whether impaction is more common in the upper than in the lower jaw. Some twenty years ago I removed an upper-jaw osteoma in which was embedded a cuspid tooth; the gap made was filled with an obturator made by a student of the New Orleans College of Dentistry.

*Dr. Guthrie.*—The question is not put to me to answer. However, I will undertake to tell Dr. Gessner the reason why the radiograph did not show the unerupted tooth. The reason is that the radiograph was not taken at the proper angle. There is no reason why the picture should not show an unerupted tooth. If the radiograph is taken at the right angle it will show very well the shadow of an unerupted tooth.

*Dr. Friedrichs* (closing).—In answer to Dr. Guthrie, I would say that possibly the angle in which the picture was taken may explain why it did not show the two impacted teeth.

In reference to Dr. Provosty's case, he need not have feared the resulting deformity, as any deformity occasioned by the removal of any of the fixed part of the face can readily be corrected.

In reference to the frequency of impacted or unerupted teeth in the lower and upper jaw, the relative frequency, I would suppose the lower wisdom tooth represents the most frequent tooth in which this condition occurs; with this exception, the lower jaw seems to be free from complications of this kind. In the upper jaw all the teeth, centrals, laterals, cuspids, bicuspid, and molars, are all at times involved, the cuspid leading in frequency. I do think the dental plate would not have shown the bicuspid tooth in my case, as it was above the alveolar process and in the maxillary bone. The dental film did show the cuspid.

## FISTULA OF THE PAROTID IN WAR WOUNDS OF THE FACE AND JAWS\*

BY PERCIVAL P. COLE, M.B., CH.B., F.R.C.S., ENG.

*Honorary Surgeon, King George Hospital; Assistant Surgeon, Cancer Hospital;  
Late Hunterian Professor, Royal College of Surgeons, Etc.*

WITH A NOTE ON RADIATION TREATMENT BY ROBERT KNOX, M.D.

*Radiologist, King's College Hospital, Cancer Hospital, Etc.*

**F**ISTULA of the parotid gland or its duct is a relatively rare complication of facial wounds. Throughout a period of nearly four years, during which time wounds of every grade of severity have come under my care, only some 16 cases have been noted. These fistulæ may be conveniently classified thus:

\*Reprinted from the *Lancet*, London, June, 7, 1919.

Fistulæ of the duct						{	Incomplete.
"	"	gland.	...	...	...		Complete.

The differentiation of incomplete fistula of the duct from fistula of the gland is difficult, and the diagnosis is sometimes a mere probability based on the position of the fistula. Operative verification has not been available, for both have a tendency to heal. Should healing be delayed, the application of radium or x-ray is indicated. Gland fistulæ and incomplete fistulæ of the duct have never failed to respond to radiations.

Complete fistula of the duct is incurable except by operative methods. These methods may be grouped into three classes: 1. Seton operations. 2. Atrophy operations. 3. Reparative operations.

Seton operations are mentioned only to be condemned. They usually fail and render more difficult any subsequent reparative procedure. Atrophy operations aim at inhibiting secretion by cutting off the secretory nerve impulses to the gland. These secretory fibers run in the auriculotemporal nerve, and are destroyed either by resection or avulsion. This procedure is precisely analogous to that of the plumber who would remedy a leak in a pipe by cutting off the water supply to the house. The method has been advocated by some American and French surgeons on the grounds that the operation is easy, that absence of secretion causes no discomfort, and that reparative operations leave an ugly scar. Unless other things are equal, the plea of facility can lay no claim to serious consideration, for at the present time these cases should only be entrusted to surgeons who can confidently carry out any procedure that will give the best result.

Other things in this instance are not equal, for in the two cases that I have encountered dryness of the mouth on the side affected was a cause for complaint, and in both cases an opportunity was afforded at the operation of excising scar tissue which had formed as a result of the original injury.

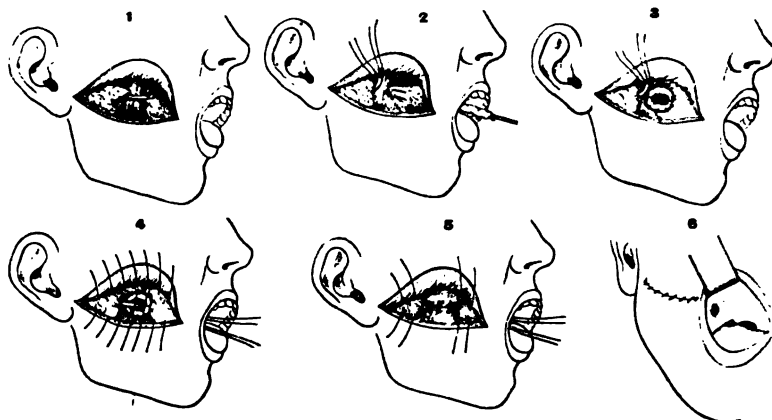
In both cases several previous attempts had been made to reestablish communication with the mouth by seton methods, the only result being to diminish plasticity by the increase of scar tissue, and so add new difficulties to those already existing.

#### DESCRIPTION OF OPERATION

It is proposed to describe briefly the steps of the operation undertaken in these two cases. The general principle adopted was that if the duct will not reach the mouth cavity the mouth cavity must be made to reach the duct. A curved incision was made with convexity down and a small flap reflected upwards (Fig. 1). This displayed the duct, the distal end of which was ill-defined and buried in scar tissue. A small lateral hole in the duct marked the limit of patency. The duct was then freed, its terminal portion resected, and two very fine catgut traction sutures were passed through its walls. The mucous membrane covered by buccinator was then made prominent immediately in front of the masseter by means of a small swab pressed against it from inside the mouth, and a small longitudinal incision was made through it into the mouth (Fig. 2). The masseter was nicked at its anterior border and the margins of

mucous membrane stitched to the deeper margins of the wound, as shown in Fig. 3.

Through the aperture thus created the stay sutures were passed and the duct was gently pulled into the funnel-shaped extension of the oral cavity. The duct was buried in the extension and the extension cut off from communication with the exterior by catgut sutures passed as illustrated in Figs. 4 and 5. The skin wound was then sewed up, drainage being established through a small stab incision. Each stay suture through the duct was then made to take a good hold of mucous membrane inside the mouth, so that when tied the duct was secured in place (Fig. 6). In both cases slight suppuration with a discharge of saliva occurred about the tenth day. Communication with the mouth had, however, been well and visibly established and firm healing occurred in a few days. Both cases were kept under observation for three weeks and were then discharged as cured. No branches of the facial nerve were identified and no facial paralysis occurred.



Figs. 1—6.

#### TECHNIC OF RADIUM EXPOSURES FOR PAROTID FISTULA

The treatment in all the cases dealt with was the same; namely, exposures to a penetrating radiation from 200 mg. of radium contained in platinum tubes of a thickness of about  $\frac{1}{2}$  mm.; in addition 3 mm. of lead were exposed to cut off all or nearly all of the hard beta radiation and allow of the gamma radiation being used. The radium tubes were enclosed in rubber tubing and in addition several layers of lint were used on the skin to cut off any secondary radiations from the metal filters. An exposure of three to four hours was given to each skin area. In one case each area received six hours' exposure. The variation in the time factor was estimated on the condition of the tissue in each case, those with considerable induration of tissue receiving longer exposures than the others.

No marked reaction was obtained in any of the cases treated. In a number of patients x-rays were combined with the radium treatment, small doses being given at short intervals; the x-rays were filtered through 2 mm. of aluminum.

# DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Under the Editorial Supervision of

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It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

## THE SYSTEMATIC DEVELOPMENT OF X-RAY PLATES AND FILMS

By LEHMAN WENDELL, B.S., D.D.S., MINNEAPOLIS, MINN.

*Chief of the Photographic Work, Instructor of Prosthetics and Orthodontia,  
College of Dentistry, University of Minnesota.*

CONSIDERING the widespread use of radiograms, one notes with surprise how few of the countless numbers produced are completely satisfactory. Many of them bear evidence of having been taken with a faulty or inferior machine, others have been taken at the wrong angle and are so badly distorted that they do not present the anatomical relations at all truthfully; the vast majority, however, are bad from a photographic point of view, and a film or plate that is bad photographically is more or less unreliable for diagnostic purposes. So universal is this last named fault that there can be no doubt but that the majority of operators fail in one or more of the fundamental principles of photography, and the efficiency which their knowledge of radiography should give them is lost by faulty photographic work. Many seem to think that proficiency in handling the x-ray machine is all that is necessary, the development of the exposed film or plate being so simple and automatic a process that it would be foolish for the operator himself to waste any time over it. But that is a mistake. It is like a man who, knowing nothing about photography purchases a very expensive camera, in the belief that the anastigmatic lens and the elaborate accessories will compensate for his lack of knowledge of photography.

### METHODS OF DEVELOPMENT

Three methods of developing a photographic plate are in common use. The first may be called the "tray, or visual inspection, method," the second the "factorial method," and the third the "tank, or stand, method." The factorial method is gradually being superseded by the tank method, and I shall therefore limit this brief article to the tray and tank methods.



## TRAY, OR VISUAL INSPECTION, METHOD

By the tray, or visual inspection, method is meant a method wherein the worker watches the plate or film as it develops, and judges the completion of development by the appearance of the negative.

It is a curious fact that this method is practiced by two classes of workers—the most advanced, and the least advanced. It is the system that some of the most experienced photographic workers employ, and it is the system by which the veriest tyro in matters photographic will try to coax an image out of a reluctant plate. It is the system almost universally employed by radiographers, because of its seeming simplicity. However, the simplicity is only apparent, not real. In fact, far from being a simple method; it is the most difficult of all methods, and to master it requires first of all a thorough knowledge of photography and



Fig. 1.



Fig. 2.



Fig. 3.

secondly years of practical application. The worker who follows these methods places the exposed plate in the developing dish, and flows the developer over it, or in the case of small dental films, the tray is filled with the solution and the films submerged in it. From time to time the plate is removed from the dish, and an attempt made to look through it by the light of the red lamp, and to form a judgment as to how far development has proceeded. This sounds like simplicity itself, and so it is when you know how to do it, but until you do, it is the reverse. You will find that considerable experience is needed before you can with certainty decide that a negative is or is not fully developed. The negative is practically opaque before it goes through the fixing bath, and even if it were examined in broad daylight it would be difficult to judge the density.

The most glaring mistake that the radiographer makes when he employs the tray method is that he pays not the slightest heed to the temperature of his

solution. He fills his tray from a bottle of stock solution, and, for all he knows, the temperature of the bath may be 60° or 70° or 90°. With too cold or too warm a developer he may produce a negative which will appear correct when viewed before the red light, but the finished product will not be correct. For instance, three plates developed at varying temperatures (50°, 65°, 80° F.) can be developed to a point where the opacity will appear to be identical when viewed before the red light, but when these same plates have been fixed, washed and dried, it will be found that only that plate which was developed at 65° F. is perfect, the other two being inferior as regards brilliancy, detail, and gradation.

A comparison of Figs. 1, 2, and 3 will make the point clear. All three films were given the same exposure, namely, two seconds. The films were next developed in solutions of varying temperatures, and in each case development was carried to a point where the opacity seemed correct when viewed before the red light. Fig. 1 was developed at approximately winter temperature (50° F.); Fig. 2 at the normal temperature (65° F.); and Fig. 3 at summer temperature (80° F.). What was the result? Fig. 1 shows a weak image, lacking in brilliancy and detail, and for diagnostic purposes the picture is worthless. Fig. 2, which was developed at a normal temperature, is rich in detail, brilliancy and contrast. Fig. 3 is too dense, it has a decided muddy appearance, and the details are largely hidden in the general opacity.

Owing to the unsatisfactory nature of tray development, and the great temptation not to standardize it, I strongly urge against its adoption. Should the radiographer, however, insist on using this method, there is only one way in which it can be used successfully; that is to *develop for a given length of time at a given temperature*. The best working temperature is 65° F., and the time of development is usually from five to seven minutes, depending upon the developer used.

#### TANK, OR STAND, METHOD

The tank, or stand, method is the ideal method of developing x-ray plates and films, and no radiographer who has given it a thorough trial will be satisfied with the old haphazard tray method, where the element of chance comes so largely into play. The tank method is probably more practiced by photographers today than either of the other methods. Yet, strange to say, few radiographers have gone to the trouble of acquainting themselves with it, although it is the only method with which the worker not thoroughly skilled in photography can hope to produce uniform results.

*Tank development is based on the action of a developer of a given strength, for a given length of time, at a given temperature.* The chief reason it gives such splendid results is that the radiographer is *compelled* to know the temperature of his developer in order that he may know when development should be stopped.

The idea is quite prevalent among those not experienced in photography that the tank method can take care only of normally exposed plates, whereas under- and overexposures must necessarily come out of the tank under- and overdeveloped, as the case may be. This idea is erroneous. The old theory that an

underexposed plate should be given a prolonged or forced development, and that an overexposed plate should be given a shortened development is wrong. Let us see why. When an underexposed plate is placed in the developer the image builds up very slowly. The novice is apt to prolong the development for an immoderately long time, hoping to bring out the missing detail, but he forgets that he can not bring out what is not there, or what the light has not impressed on the plate. All he does is to add *density* to the parts that *do* put in an appearance, so that an underexposed plate that has been forced in the developer shows contrast, but lacks detail. In the case of the overexposed plate what is the result? The image flashes up quickly and the whole plate darkens rapidly. The inexperienced workman is apt to remove the plate from the developer too soon, with the result that only the superficial layer of the emulsion has been acted upon, and on fixing he will find the plate very thin and without contrast, and almost useless.

Now, what would happen if under-, over-, and normally exposed plates were developed at the same time in a tank? The underexposed plate would be thin, not too contrasty, and would have all the detail possible. The overexposed



Fig. 4.



Fig. 5.

plate would be dense, but full of detail and gradation. The normally exposed plate would, of course, be normal in every respect. We may then formulate the following rule: *all plates should be developed for the same length of time, regardless of exposure.* It is true that the professional photographer does not follow such a rule, but we must remember that the professional photographer has had years of experience in matters photographic and knows exactly what will happen when he departs from the normal. The radiographer, on the other hand, is not likely to be a skilled photographer and for that reason I strongly recommend that he standardize the development, making it mechanical rather than relying upon his own judgment. Development should therefore proceed for a definite length of time. If that rule is followed, thin negatives will at once indicate underexposure; dense negatives, overexposure, and such negatives should be corrected after development by intensification or reduction.

When a negative has been developed it should, of course, be carefully rinsed and then placed in the fixing bath. Owing to the limited space I can not here go into the question of fixation, but as the process is quite automatic, an explanation is unnecessary. It is also unnecessary in these brief pages to give formulas

for developers and fixing baths because formulas usually accompany chemicals and photographic goods.

Fig. 4 represents a negative which was badly overexposed, then developed by the tray method to a point where the opacity seemed correct, as judged by the dark-room light. The opacity, however, was only superficial, the deeper layer of the emulsion being untouched by the developer, and when the negative was placed in the fixing bath the undeveloped silver bromide was dissolved and finally washed away under the tap. The result is a thin negative, lacking detail, brilliancy and contrast.

Fig. 5 shows a negative which received the same exposure as Fig. 4. In this case development was carried to its logical end and the result was a negative so



Fig. 6.

dense that transmitted light would scarcely penetrate it. The negative was fixed in the usual manner, then placed for a brief time in the reducing bath described later, and the result was a negative which is normal in every respect.

#### INTENSIFICATION

Negatives which show detail, but are not dense enough can be intensified in the following solution:

No. 1	
Bichloride of mercury	200 grains
Bromide of potassium	200 grains
Water	10 ounces



Fig. 7.

No. 2

Sulphite of soda  
Water

$\frac{1}{2}$  ounce  
4 ounces

After the negative is well fixed and *thoroughly* washed, immerse it in No. 1 until it has become thoroughly whitened, and after rinsing carefully, place it in No. 2, leaving it there until full density has been attained.

Fig. 6 shows a print from an underexposed but normally developed negative.



Fig. 8.

Owing to the thinness of the original negative there is a lack of contrast, and the brilliancy so much desired in a plate is largely lost.

In Fig. 7 we have a print from the same negative after intensification. The improvement is marked. The general flatness of the first print has disappeared and an added brilliancy is the result.

#### REDUCTION

Negatives which are too dense all over, due to overexposure, or to overexposure and overdevelopment, should be reduced with Farmer's reducer, as follows:

	<i>A</i>	
Water		16 ounces
Hyposulphite of Soda		1 ounce



Fig. 9.

*B*

Water	16 ounces
Red Prussiate of Potassium	1 ounce

As solution *B* is affected by light, the bottle containing it should be of amber color or wrapped in opaque paper.

## Mix for immediate use:

<i>A</i>	8 ounces
<i>B</i>	1 ounce

## Use in subdued daylight

The negative can be transferred to this solution direct from the fixing bath without rinsing. The action is very rapid and must be watched closely. To avoid streaks, always rinse the negative before holding it up for examination. When sufficient reduction has taken place, wash the negative thoroughly in running water.

Fig. 8 represents a badly overexposed but correctly developed negative. The opacity is so great that the details are practically hidden, while the flesh tones have entirely disappeared.

Fig. 9 shows the same negative after reduction with Farmer's reducer. The negative is now rich in detail. The cancellous structure of the bone is clearly brought out, even the finger nails and delicate folds of the skin are to be seen. (This figure is imperfectly brought out in reproduction.)

## DENTAL INFECTIONS FROM THE VIEWPOINT OF THE ROENTGENOLOGIST\*

BY ROSCOE L. SMITH, M.D., LINCOLN, NEBR.

**A**S a roentgenologist, it has been of great interest to review my experience in connection with dental infection during a period of over five years and note the change that has taken place among physicians, dentists and laymen.

At first the roentgenologists were blamed or largely discredited for placing so much importance on the findings of the so-called periapical abscesses and other infective processes about the teeth.

This indifference, if I may term it such, has been replaced by a very different attitude on the part of doctors of medicine and dentistry and incidentally by the laymen themselves until at the present time it is an accepted fact, proved many times in everyone's experience that these so-called focal infections do cause and are responsible for a great many serious disturbances experienced by patients afflicted with this type of disease.

\*Read before the joint meeting of the Lancaster County Medical Society and the Lincoln Dental Society, February 15, 1919, Lincoln, Nebr.



Although it is unjust and unfair to blame all of the systemic disturbances on tooth infection, they certainly are responsible for a large, generous portion of the disturbance. The tonsils and the accessory sinuses are also important etiologic factors and to my mind share the responsibility equally with dental infection, with the exception that they are more apt to cause acute symptoms and thus manifest themselves at a much earlier stage and therefore receive radical treatment.

In medicine, and I presume in dentistry also, the pendulum of popular opinion swings slowly from unbelief to the full acceptance of the most radical opinion and later drops back to a more conservative stride.

To my mind the past few years have taken us through just such changes, yet there is still much difference in opinion and I feel that we are still far from a standard.

The difficulty in carrying out or standardizing methods and opinions on this subject, I believe, is due principally to the different interpretation of these pathologic changes, and the interpretation of these changes must be based on anatomy and pathology.

One individual may give an opinion on a roentgenogram, as normal unless he finds a large periapical shadow. The processes may be largely destroyed, and yet, are not taken into consideration. If there is but a small area he may think the area too small and insignificant to cause disturbance in physiologic functions. Another individual may be an extremist of the opposite type and say that all devitalized teeth, whether properly filled or not, are infected teeth and are possible sources of systemic disturbances on the theory that the tubuli in the dentine are devitalized and infected.

To state my viewpoint as a roentgenologist and from a roentgen standpoint, I believe that all devitalized teeth that show definite areas of osteomyelitis at the apex; that show definite granuloma or infection and death of the peridental membrane from below upward; teeth with normal or devitalized pulp that show extreme destruction of the peridental membrane with marked receding of the gingival border and marked destruction of the bony processes, in patients suffering from systemic disturbances, are a menace, and the probable etiologic factor in their particular case.

# **ABSTRACT OF CURRENT LITERATURE**

**Covering Such Subjects as**

**ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY**

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

**Cleft Palate and Harelip. W. L. Shearer. The Nebraska State Medical Journal, 1919, iv, No. 4, p. 106.**

With special reference to the treatment of this distressing deformity, it must be borne in mind that the palate is one of the most important organs of speech, and on account of its direct attachment to the larynx, constitutes a most valuable factor in voice production. The author points out that the articulation of consonant sounds is very difficult for children afflicted with cleft palate, in proportion to the extent of the gap. Judicious treatment must aim not only to closure of the palate, by far the most important point consisting in the creation of a flexible resilient palate, as required in phonation.

Infants with complete cleft palate and either single or double harelip should be treated in three steps, as follows: (1) Bone surgery, if possible within the first month. (2) Lip and nostril, six weeks after the bone operation, or earlier if the bone operation has proved a success and the splints have been removed. (3) Soft palate, about the fourteenth to sixteenth month, preferably. The bone surgery should be done early before ossification has advanced, the bones being more easily moved to the position desired, while the shock to the patient is less. At birth the bones are about half organic matter and easily bent. When there is double cleft with premaxillary protrusion, this premaxillary bone must never be excised. A deformity follows which is by far greater and more difficult to repair than that originally presented; it is in fact a calamity that can not be repaired. With the excision of the premaxillary bones go the tooth germs, and the child is forever missing temporary as well as permanent teeth. They must be put back in position to form a normal arch. The success of the subsequent operations depends on the closure of the cleft of the bones. Under an appropriate technic, the physiologic functions of the palate are restored. In operating on the lip and nostrils, as well as the soft palate, great care should be exercised not to traumatize the tissues more than is necessary, as sloughing, particularly in the soft palate is apt to follow. Lateral incisions in the soft palate are unnecessary and should never be made, because in so doing the tensor palati muscle and nerve are very likely to be severed, and once severed do not reunite. Following in the

wake of this unfortunate procedure is deafness, owing to the fact that by traction in the act of swallowing and speaking the tensor palati muscle dilates the pharyngeal orifice of the eustachian tube. Permanent sutures left in the mouth at the completion of any of these operations should be silver wire, lead plates, and horse hair, for the reason that they do not absorb the saliva which is constantly contaminated with different forms of bacterial life.

**Some Interesting Cases in Oral Surgery. I. Morton. *The American Journal of Nursing*, 1919, xix, No. 9, p. 678.**

From her experience in the office of an oral surgeon and radiologist, the author reports some instructive cases which show the importance of radiography in oral conditions which have affected the general health of the patient. In the case of a young man who had been treated several years for tuberculosis, but had never entirely regained his health, radiography revealed a large granuloma at the end of the root of two broken off teeth; the removal of the granuloma was followed by rapid improvement and restoration of working capacity. In another case, an unrecognized dental anomaly resulted in ocular disturbances with severe headache. Radiography showed an impacted upper left bicuspid, meaning that a fully developed tooth was embedded in the bone, lying in a horizontal position above the roots of the other teeth. The condition of the eyes was relieved after the removal of the offending tooth. A similar observation, showing an impacted eye tooth embedded deeply in the bone, was made in the case of a young woman suffering from a series of nervous disturbances all of which subsided after the removal of the tooth under general anesthesia. In still another case, a partially developed second deciduous lower molar remained embedded in the bone and the second permanent bicuspid was forced into a tipped position by the development of the first permanent molar, so that the partially developed deciduous tooth was lying under the tipped permanent second bicuspid, and the molar rested on the bicuspid, making the three teeth lie one above the other. This decision, as reached after radiologic examination, was verified when the teeth were taken out, together with a considerable amount of necrosed tissue. The patient, a woman in the early forties, steadily improved in health after the performance of the operation, under novocaine conductive anesthesia.

**The Occlusion of the Palatine Opening After Resection of the Upper Jaw. M. H. Morestin. *Bull. et mem. Soc. de chir. de. Paris*, 1918, xliv, 102.**

The reparative operations upon war wounds which persist as large openings between the nasal fossa and the mouth have been suggestive of valuable methods in closing the palatine opening which follows excision of an extensive tumor of the upper jaw. As Morestin believes that it is practically always possible to close off the nasal fossa from the mouth, he advises occlusion of the palatine opening as a necessary complement to resection of the upper jaw. If for various

reasons this can not be undertaken immediately after the primary operation, a second autoplasmic operation is usually indicated and possible.

Although the palatine opening which is the result of an operation may be surprisingly reduced in the course of spontaneous cicatrization, in one case which Morestin reports the opening measured as much as 3 to 5 centimeters from front to back and 2 to 4 centimeters across. Morestin divides the plastic operation which he performs in the cases referred to him a few months after the primary operation into four stages: (1) The refreshing of the circumference of the opening; (2) the dissection and the freeing up of the mucous membrane of the cheek; (3) the detachment of the palatine fibromucosa, and (4) the suturing. A knife is used for refreshing the outline of the opening; the fibromucous ring bordering it may either be entirely removed or divided. A margin of tissue left on the inner side of the opening, refreshed and turned toward the mouth, will later come in contact with the raw surface of the mucous membrane of the cheek. The freeing up of the mucosa of the cheek is begun at the very edge of the opening for refreshing and extends forward to the gingivolabial groove and backward toward the posterior portion of the buccal vestibule; great care must be taken to avoid slipping the instruments into the thick part of the cheek. When the flap is large enough so that it can be drawn to and even beyond the opposite edges of the opening, the fibromucosa near the opening is loosened, and as far as possible, detached. The suture with "Florence" horsehair in a small bent needle of Reverdin, drawn from the back forward, offers no difficulties if the freeing up has been sufficiently liberal. The operation is most satisfactorily carried out under a local anesthetic.

In two of the four cases of reparative operations which Morestin reports, the opening was closed completely upon the first interference; repeated operations, during each of which a flap was freed from about the mouth of the opening and turned back into the opening into the nose, were necessary to close the openings in the other two cases. In these latter cases, the operator's first experience with this method of freeing the mucous membrane from the cheek, he did not make the flaps large enough.

Morestin attempted closing the palatine opening immediately after the resection of the upper jaw for malignant tumors in three cases. Unfortunately the general condition of two of the patients was so poor that they died within less than twenty-four hours; the plastic operation had, however, prolonged the primary operation but a few minutes, and the results indicated by the union of the mucosa of the palate and the cheek were very satisfactory.

Morestin's method of closing the opening which persists after resection of the upper jaw does not interfere with the wearing of an apparatus designed to lessen the facial depression; the metallic plates used to distend the mucosa of the cheek are changed for thicker and thicker ones until the patient's mouth has become adapted to such an apparatus. The author emphasizes his belief that the reparative operation may be undertaken, in the majority of cases, immediately after the primary operation.

**Extraction of the Six-Year-Old Molars.** L. Mudie-Petrie. *British Dental Journal*, 1919, xl, No. 11, p. 405.

The author emphasizes in the first place that the six-year-old molar is such an important factor in determining the positions of the permanent teeth and takes such a permanent and useful part in mastication that its removal is a very great loss whether irregularity exists or not. Secondly, where irregularity does exist, almost every case can be traced to causes which occur in early childhood, and that it is an absolute fallacy to wait beyond the eighth year before applying treatment for correction. Lateral growth of the jaw stops at the eighth year, and if slow expansion is to be commenced for the purpose of helping the jaw to grow, it should be done before eight years of age. The damage is done long before the twelve-year-old molar is in place. The natural and logical method is to stimulate the bone-growth before maturity sets in. To remain inactive until the second permanent molar erupts for the purpose of extracting the first, is not logical, especially when we know that the condition is daily becoming worse, and that the extraction itself will contribute to further dislocation of articulation. In certain cases, however, extraction is imperative, and it must be resorted to: (1) In open bite, which can be considerably corrected in some bad cases by the extraction of the first molar. (2) In serious pathologic conditions where the preservation of the tooth would be impossible, for example, abscess, tumors, etc. (3) In anomalies of the teeth themselves, such as peg-shaped and abnormal teeth or in germinated teeth where they do not fulfill their proper function. (4) In cases where the upper or lower teeth have already been extracted. In summing up, the author says that extraction of the six-year-old molars for the purpose of obtaining an alleged immunity from caries, and for some vague reason of gaining room in the dentition, should be dismissed as an unestablished, inconsistent, and useless theory. Further, that extraction for the relief of overcrowding in most cases is contraindicated, especially in the early stages, and should never be adopted as a principle. Finally, extraction is absolutely imperative only under conditions similar to those already mentioned.

**Macroglossia and the Simian Protrusion and Separation of the Teeth in the Course of Dementia Precox.** Bayard Holmes. *Chicago Medical Recorder*, June, 1919, xli, No. 6, p. 222.

The deterioration of our insane adolescents is often suggested by the deformities of the face and senescence of attitude. It is not possible to mention more than one of them in connection with one patient—a well educated and regular featured young man whose photographs of a few years ago exhibit a countenance of real comeliness. Now the teeth are separated from one another and the incisors on both jaws everted and thrust forward. The tongue is greatly enlarged. The molars and premolars have produced deep indentations on the side of the tongue. Even when the mouth is open and the tongue protruded the greatly enlarged and thickened tongue seems to fill the roof of the mouth. There

is an even, thick feeling to the tongue with no enlarged glands, no tenderness, and no abnormality of the mucosa which could account for the condition.

This thickening of the tongue and protrusion of the teeth is observable in a large proportion of dementia precox patients, and gives them the unattractive, if not repulsive, appearance they often present. It is not always an early symptom.

Macroglossia is a common symptom of finding in mongolian and cretin idiots. It also appear in certain syphilitics. Its various forms and the histologic conditions found in each have been described by Butlin and Spencer and by a great number of histologists (v. Cat. Surg. Gen. Library, under heading, tongue). So far as my own study of the literature has gone, no one has called attention to this condition as a symptom of dementia precox.

In many infectious diseases macroglossia or temporary enlargement of the tongue is common enough. It is well recognized by dentists as a cause of prognathism and separation of the teeth. It seems but natural that the toxemia of dementia precox should produce enlargement of the tongue and the simian face, especially in emaciation, which was looked upon by our psychiatric ancestors as a stigma of mental disease. The very fact that the simian prognathism is a traditional stigma of mental deterioration speaks for the possible frequency of macroglossia.

**Inflammatory Affections of the Visual Organ Due to Dental Disease. Wirtz.**  
*Revue Tri mestrielle Suisse d'Odontologie* 1918, xxviii, No. 1, p. 78.

Infectious germs from chronic unrecognized dental affections may reach and inflame the eyeball alone, without demonstrable involvement of the surroundings. Three such cases have been reported in the literature. The author's observations during seven years, with special reference to the etiology, serve to show that intraocular disease of dental origin is relatively frequent, especially in the uvea. Among metastatic eye diseases due to affections of the teeth, he describes suppurative chorioiditis, with subsequent panophthalmia, suppurative iridochorioiditis with subsequent atrophy of the bulb. The following eye diseases may be caused directly by dental troubles, and are the most important because they furnish positive proof of the part played by dental inflammatory processes in the origin of many ocular affections: Acute and subacute iridocyclitis; exudative central chorioiditis with mild optic neuritis; phlebitis of the retina. Eye diseases caused indirectly by dental affections include: Parenchymatous keratitis; bilateral chronic iritis; chronic unilateral blepharoconjunctivitis with marginal keratitis.

It results plainly from the author's observations that dental diseases are capable of involving the eyeball and giving rise to internal and external ocular inflammations. The truth of this statement is illustrated by the successful results of dental treatment. The removal of the supposedly causative processes in the roots of diseased teeth at once modified the acute eye affections which had resisted all previous treatment, rendering the further course short and favorable. In all cases, a permanent cure was obtained within eight to twelve days. These eye diseases were in part caused by the inflamed roots alone or directly or their origin was indirectly favored by the existing radiculitis. The

most common direct and dental ocular inflammations are diseases of the uvea, especially of the iris: (1) Acute iritis with involvement of the ciliary body and considerable exudation into the refractive media. These inflammations develop abruptly and destroy vision within a few days, down to light perception. The customary palliative treatment has no influence upon the course. (2) Chronic iritis is usually limited to the diaphragm of the iris and has only a slight tendency to exudation, so that the refractive media are not rendered opaque even after the trouble has lasted for years, and vision is not seriously affected. The course is characterized by a large number of recurrences, which usually yield to palliative measures.

These eye diseases are undoubtedly infectious, due to bacteria derived from the root foci, and reaching the eye from the diseased tooth by way of the blood stream, more particularly the veins. In the author's cases of acute iritis, the oral conditions were very bad, many teeth were destroyed, ached periodically, and were filled with decomposing remnants of food. The patients with chronic recurrent iritis had better-kept and properly treated diseased teeth. The trouble in the last group of cases is chiefly referable to the customary method of conservative dental treatment. Two essential factors in the origin of dental internal eye diseases were found in the form of artificial or occasional closure of an infectious chronic root process also toward the outside, and in recrudescence of the radiculitis through injurious influences, for example, a chill or a change in the weather. Next, the spreading of infectious dental disease is favored by gold caps over diseased teeth, clasps which irritate the root, and badly fitting prostheses. Chronic dental affections may act as a partial cause of chronic eye disease. A syphilitic or tuberculous virus may act as the determining cause, while the dental process constitutes a preparatory cause for all recurrences.

**Local Anesthesia in Children.** *American Journal of Surgery*, 1919, xxxiii No. 5, p. 121.

At first blush, the application of local anesthesia for operations upon children theoretically seems almost hopelessly contraindicated. That is why we are much interested in a recent report of Farr (*Interstate Medical Journal*, Feb., 1919), who cites 77 cases, including operations upon almost every part of the body, in which this method proved successful; in only seven was it considered necessary to administer inhalation anesthesia. Farr says that relatively speaking novocain is as safe in the child as in the adult. Moreover, the psychic element is not so important in children as in adults. In very young children, restraint may be necessary, but in the majority of children over four, no mechanical restraint is necessary. Very often a bribe goes a long way in maintaining quiet during the operation. In only one case did postoperative vomiting occur, and this was in a patient with hypertrophic pyloric stenosis. It is absolutely necessary to be extremely refined in surgical technic when operating upon children under local anesthesia; rough dissection and manipulation is outlawed; Farr appropriately designates the method as "Healthy." This is especially true in the manner of handling the retractors. They must be slowly and carefully placed and not allowed to slip out of the wounds when the anesthesia is successful. The

inspection of the abdominal contents is more perfect than under inhalation anesthesia, resembling that seen in the cadaver, when all the organs are flaccid. Vertical traction and tilting are used to bring the organs into view. Farr describes his method of infiltration in detail. Complete filtration of all the tissues is necessary before beginning the operation. The most important point, aside from this, is the avoidance of pain in making infiltration. This is done by making all secondary wheals from beneath, and by making subdermal rather than intradermal injections for the anesthesia of the skin. The fluid should advance into the tissue just ahead of the needle.

Local anesthesia is slowly robbing general anesthesia of much of its dangers, and if children, in whom it has hitherto seemed contraindicated, come into the field of applicability of local anesthesia, an important surgical advance has been attained.

**Oral Bacteria Exhibiting Streptobacillary Characters.** Ch. L. Kelsey. *British Dental Journal*, 1919, xl. No. 10, p. 373.

The streptobacillus here considered was first isolated from a case of pyorrhea alveolaris, and being found in a number of subsequent cases it was decided to make it the subject of the present research; the objects being to find the frequency of its occurrence in oral lesions, more particularly in pyorrhea alveolaris and associated conditions to decide the most favorable liquid and solid media for its culture, to find which of the disinfectants in use in the mouth would destroy the organism, in what strength it must be employed, and the length of time it must be in contact with the organism. The general conclusions reached were as follows: The organism is a gram-positive, nonliquefying, non-motile streptobacillus. Its presence occurs in pyorrhea alveolaris, gingivitis, pulpitis, tonsillitis, pharyngitis. It fails to grow on many of the ordinary laboratory media. It prefers a medium that has been enriched by the addition of animal albumin and that has an acid reaction. Ascitic agar and ascitic broth give the best growth. Saliva causes agglutination of the streptobacilli. The organism exhibits remarkable resistance to the action of many disinfectants, but is rapidly killed by iodine, that being the most efficacious and convenient disinfectant for use in the mouth. Oil of cloves, lysol, and tincture of myrrh also rapidly destroy it, but they are not so favorable for oral treatment. The pathogenicity is not fully determined, but the serum of animals injected with the streptobacillus contains specific antibodies that cause agglutination of the organisms. Antistreptococcal serum has no agglutinating effect upon the streptobacilli.

**Cause of Dental Caries.** Stannus. *British Dental Journal*, Sept. 15, 1917 xxxv, 729-744.

Although considerable difference of opinion exists with regard to the influence exerted by oral sepsis on the general health, there is no disagreement as to the harmfulness of dental caries. There may be skepticism regarding the statements of well-known medical practitioners that oral sepsis is the *fons et*



*origo* of the majority of systemic diseases, but there can be no denial of the fact that dental caries is a serious condition, tending to ill health. The inability to masticate food properly when dental caries is present is sufficient in itself to demonstrate this. When a person can not chew food thoroughly, digestive disturbances may occur not infrequently. It is generally supposed that people leading a primitive life suffer little with their teeth. This is true to a large extent. However, even natives of Africa living in a cleanly, natural manner are by no means immune to dental caries. Dr. Stannus examined the entire population of a series of villages in the West Nyasa District of Nyasaland. Their diet was chiefly cassava made into porridge and some eaten raw, other constituents being ground nuts, fish, a little maize or millet, flour porridge, green vegetables and bananas. Of 1,311 persons examined, 1,038 of whom were adults, 8.6 per cent showed caries. Stannus concluded that native Africans have no immunity to dental caries, and that the same causes and predisposing conditions are the source of caries among them as among people of civilized countries. The small comparative incidence of caries among natives living under natural conditions is due to the absence in large proportion of those predisposing conditions found in civilized races, irregular dentition, lack of proper mastication, and want of the use of the teeth, owing to the eating of soft foods. It has been urged by many that one of the main causes of dental caries is the eating of food that requires little mastication, and that consequently dental caries has increased greatly because in civilized countries so much soft food is consumed. Dr. Harry Campbell of London may be termed the high prophet of this propaganda, and he preaches in and out of season of the injury to the teeth and to the health done by eating "pappy" food. The teeth were intended to be freely used in the mastication of hard food. When they are not so used they tend to decay, and the general health suffers.

**The Normal and Pathological Histology of the Mouth. Volume II. Pathological Histology.** A. Hopewell Smith. Textbook, Blakiston & Co., Philadelphia, 1918. Editorial in *Annali di Odontologia*, 1919, iv, No. 2, p. 40.

An editorial in the Italian monthly periodical calls attention to the recent publication of the second volume of an important contribution to odontologic literature by the able teacher of dental histology, pathology, and comparative odontology, in the University of Pennsylvania. The book is divided into three parts, pathologic histology of the dental tissues, of the oral tissues, and of the extra-oral tissues. In the first and most important part, the author discusses in detail the histopathologic conditions of the enamel, dentin, cement, dental caries, diseases, traumatic lesions, and degenerations of the dental pulp. A special chapter deals with the histopathology of the dental tissues in pyorrhea alveolaris. The second part brings a description of all the pathologic conditions of the gums, palate, maxillary antrum and maxillary bones, terminating with a fine chapter on oral microbiology. The third part deals with the development of teeth in teratomatous tumors.

**Droplet Infection and Its Prevention by the Face Mask.** G. H. Weaver.  
*The Journal of Infectious Diseases*, 1919, xxiv, No. 3, p. 218.

Droplet infection comes into play whenever an individual with pathogenic organisms in the mouth gets into close contact with another individual. Sneezing and suppressed coughing are most apt to produce abundant droplet spray. Gauze will filter bacterial spray from air. Its efficiency is in direct proportion to the fineness of mesh and number of layers employed. Three layers of gauze with a mesh of 40 threads or more will remove almost all bacteria-carrying droplets. Occasionally fine droplets pass through. Gauze masks appear from clinical data to prevent infection through mouth droplets. They are useful when worn for protection by attendants on the sick, and also when worn by the infected individual to prevent contamination of his surroundings. The use of masks should not lead to neglect of measures calculated to prevent transfer of infectious materials by other means than by droplet spray.

The nurses in the Durand Hospital of the John McCormick Institute for Infectious Diseases, Chicago, now use masks made of three layers of absorbent gauze with a mesh of 44 by 40 and are instructed to wear two superimposed masks, making six layers of gauze, when caring for cases of virulent infections when secretions are abundant. A considerable reduction in cases of rhinitis, tonsillitis, and pharyngitis among the nurses has been noticed since masks have been worn.

**Dental Infections in Children.** A. L. Smith. *The Medical Press*, 1919, clxxxi, No. 4, p. 491.

Upon the basis of personal experience, the author emphasizes the common neglect of peridental infections in children, shown by the absence in the medical literature of a report upon the organisms present in these cases. This material comprises 109 cases of peridental infections, 4 secondary fistulas, 8 gingival abscesses, 1 abscess in the roof of the mouth, and 1 infected submaxillary gland. The children's age ranged from two and a half to eleven years. The following is a table of the organisms and their number, found in the 109 cases of peridental infections:

<i>Streptococcus hemolyticus</i>	27
<i>Streptococcus pyogenes</i>	19
<i>Streptococcus viridans</i>	2
<i>Staphylococcus pyogenes citreus</i>	9
<i>Staphylococcus pyogenes aureus</i>	37
<i>Staphylococcus pyogenes albus</i>	7
<i>Bacillus pyocyaneus</i>	1
<i>Diplococcus pneumoniae</i>	18
<i>Micrococcus catarrhalis</i>	4
<i>Bacillus fusiformis</i> (Spirochete <i>Vincenti</i> )	1
<i>Diphtheroid bacillus</i>	3
Sterile	8

All streptococci were injected into rabbits, intravenously, with the hope of finding that they might have a selective action upon the dental tissues, but in no case was this found to be true. In 48 injected rabbits, the kidneys showed multiple abscesses 5 times, the cardiac muscle one, the brain tissue once, and the joints 4 times. In each case the streptococcus was recovered. This series of 48 accordingly includes 11 metastatic infections causing pathologic lesions far removed from the original focus. This is such a high percentage that these dental infections in children can not be lightly regarded. Children's teeth, infected as these are, must be extracted, if the focus can not otherwise be sterilized and this rarely can be accomplished. Though many dentists are of the opinion that premature extraction of deciduous teeth may result in the retardation of the development of the dental arch and be the indirect cause of malocclusion of the permanent teeth, the author is convinced that these infected areas, as well as those in other parts of the body, must be eradicated. While this may be one of the causes of malocclusion, it is a lesser evil than the constant absorption of infected material from the peridental area, which may be the etiologic factor in embolic diseases of other organs of the body, as shown experimentally in this series by the high percentage of this type of infection.

**Oral Prophylaxis in Its Relation to Preventive Dentistry. A. H. Merritt.**  
**The Dental Outlook of the Allied Dental Council, 1919, vi, No. 6, p. 169.**

The most potent instrument at our command for the prevention of dental caries is mouth cleanliness. Dental caries may be defined as an acid fermentation taking place upon the surface of enamel due to the peptonizing influence of microorganisms. It is obvious that this phenomenon can not take place upon a clean and polished surface, that it is necessary for the organisms of caries to attach themselves to the surface of a tooth and remain there undisturbed for a period of time in order to produce decay. This is clinically confirmed by the fact that the labial and lingual surfaces of teeth are less susceptible to caries than are the proximal surfaces, although these surfaces are not intrinsically more resistant. The explanation is that the organisms of caries are not allowed to remain on these relatively clean surfaces long enough to effect their solvent action. If the susceptible areas were kept as clean as these more exposed surfaces they would be equally free from caries, a service incomparably greater than any which may be achieved through restorative dentistry.

As a preventive of pyorrhea, oral prophylaxis is even more effective than in caries, in that it keeps the mouth clean and through the stimulating effect of vigorous brushing, induces healthy circulation in the supporting tissues of the teeth. Probably most of the cases of pyorrhea which find their way into the hands of the periodontist would never have developed had oral prophylaxis been intelligently observed. No disease in the mouth is more easily prevented, none more difficult to cure. The vast train of diseases which have for their causes the infections associated with nonvital teeth and pyorrhea alveolaris can be prevented by proper application of the principles of oral prophylaxis.

**On the Nerve End Cells of the Dental Pulp.** L. Howard Mummery. *Proceedings of the Royal Society of Medicine*, 1919, xii, No. 3, Section of Odontology, p. 11.

The distribution of the nerves of the dental pulp to the dentine has been described by the author in former communications, demonstrating that nerve fibers actually enter the tubes of the dentine in company with the dentinal fibril and are distributed within the hard tissue of the dentine. According to recent modified methods of investigation, the neurofibrils which arise from the axis cylinders of the medullated nerves of the pulp pass into a plexus beneath the odontoblasts, but at the lower margin of the odontoblast layer, the fibers of this plexus are connected with a definite layer of nerve cells. These cells are more or less stellate in form, with a distinct nucleus. They are arranged in groups situated at fairly even distances from one another. The cells have two sets of processes which, as in the cells of the central nervous system, must be termed "axons" and "dendrons." The branched processes, or "dendrons," which arise chiefly from the lower part of the cell, communicate by synapsis with the fibers of the deep plexus, and they also give off five divisions which surround the odontoblasts, while from the distal end of the cell a long unbranched process or "axon," is given off which passes direct to the dentine and enters the tubule in company with the dentinal fibril. The nerve cells of the pulp thus constitute apparently a peripheral sensory end organ from which the final distribution takes place. Future investigations must ascertain what portion of this nerve distribution consists of trophic fibers and what of purely sensory fibers.

**Post-Grippal Paralysis of the Palatine Velum.** L. Du Pan. *Revue medicale de la Suisse romande*, October, 1918, xxxviii.

The author was enabled to observe two cases of bilateral paralysis of the velum of the palate. The first case was one of pseudo-meningitis phenomena, followed by paralysis, which lasted fifteen days. In the second case, severe headache and bronchopneumonia were noted; the patient, a child, presented no meningeal or pseudomeningeal symptom, but nevertheless a very mild paralysis of the palatine velum made its appearance. The nervous phenomena in both these cases were caused in the author's opinion by the toxin of the Pfeiffer bacillus, or rather by an endotoxin which is liberated through the dissolving bacteria. This endotoxin is held responsible for determining all the irritative or inhibitory phenomena which have been demonstrated in the various organs, and is claimed to favor the development of other bacteria in the organism.

**Ludwig's Angina.** Halphen. *Presse Medicale*, Jan. 7, 1918.

Halphen reports a case of phlegmonous inflammation of the floor of the mouth mistaken for Ludwig's angina and in which recovery was obtained after drainage through the mylohyoid muscle and removal of the wisdom tooth. The latter had been the starting point of the infection. Osteoperiostitis of dental origin is often erroneously labeled adenitis or adenophlegmon. The teeth hav-

ing no lymph canaliculi, the infection, unless a lesion of the mucous membrane exists, always travels from the dental pulp to the bone, thence to the periosteum and the cervical cellular tissue, forming what Sebilleau has termed a periperiostitis. Removal of the tooth is generally sufficient to overcome this condition. True Ludwig's angina, which is rare, is characterized especially by the gravity of the general symptoms, the patient succumbing even before pus has collected. It is thus notably different from edema, phlegmonous inflammations, and abscesses of the floor of the mouth, rather frequently met with and amenable to drainage, a well marked collection of pus, always with a putrid odor, being evacuated. In Ludwig's angina the muscles are found sphacelated. Points of resemblance consist of the almost exclusively anaërobic bacterial flora, analogous to that of pulpitis and dental caries, and the characteristic situation of the disease process. Ludwig's angina is actually a misnomer, the disease having been discovered by Gensoul five years before Ludwig. The condition is merely a hypertoxic form of the gangrenous phlegmons involving the floor of the mouth, just as massive gangrene may set in in severe wounds of the extremities and in fulminating appendicitis. In involvements of the floor of the mouth general anesthesia nearly always leads to syncope, sometimes fatal, and should be replaced by local anesthesia or anesthesia by intercricothyroid laryngotomy.

**Structure and Origin of the Dental Enamel.** E. Retterer. *Comptes Rendus de la Societe de Biologie*, 1919, lxxxii, No. 16, p. 571.

The study of the dental enamel presents considerable difficulties on account of its indefinite composition; its thinness, its hardness and transparency not always permitting its distinction from the ivory. The enamel of the teeth of dogs from one to two years of age was examined by the author who is enabled to state on the basis of histologic findings that the enamel is not of epithelial origin. The histogenesis shows that enamel never appears without being preceded by ivory; not epithelial cells, but the peripheral extremities of the ivory strands become transformed into enamel prisms. If the enamel were a transudate, it would have no structure. If the enamel were derived from the enamel organ, it could not contain spaces between the strands, representing tubules of the ivory. However, as the tooth appears only in the cutaneous mucous regions where the superficial epithelium proliferates, to give rise to a bud which becomes an epithelial sheath, it is evident that the presence of this *predental organ*, of epithelial character, imparts to the mesodermic cells which it covers and surrounds, a developmental activity and power such as to induce them to build up a tooth. Although the epithelial cells furnish no element of the tooth, the development of the predental organ is the indispensable requirement for the formation of a tooth. It creates a medium adapted to the modification of the mesodermic cell and its transformation into an odontoblast. Moreover, this new cellular species produces not only ivory, but also enamel, the odontoblast being accordingly both eburniblastic and adamantoblastic or ameloblastic. These new data were secured by investigations of the structure of the enamel and its relations with the subjacent layers of ivory.

**The Syndrome of the Posterior Lacerate Foramen.** Rimbaud and Vernet. *Bulletin et Memoires Societe Medicale des Hopitaux de Paris*, 1918, series 3, xlii, 931.

As a result of injury by a bomb in the right temporomaxillary region, the patient presented, besides facial paralysis, complete paralysis of the right hypoglossal, glossopharyngeal, and spinal accessory nerves, as shown by atrophy of the right half of the tongue and deviation of the tongue to the right, loss of taste, and paralysis of the right half of the palate. Compression rather than division of the pneumogastric nerve was indicated by signs of irritation such as a paroxysmal cough, exaggerated salivation, hyperesthesia of the palatine arch, pain in the thyroid region on the right side, and paralysis of the right vocal cord.

**Some of the Changes in the Deciduous Molar and First Molar Regions Approaching and During the Transitional Period.** R. L. Davis. *Oral Health*, 1919, ix, No. 4, p. 143.

Attention is called by the author to the necessity of maintaining arch continuity and occlusion, as intended by nature, and of employing corrective means so indicated in case of loss of tooth or teeth, in order to guard against the otherwise inevitable imperfect development of arches and facial contours. With premature loss of deciduous molars, the arch continuity being broken, the first molars under pressure of second molars may drift forward (distance according to loss) more than they should at the transitional period. They also take on a mesial tip, and often a direct result of this is that there is not sufficient room for premolars to erupt. The break in arch continuity results in an interference with Nature's plan of forward development in this region. With the loss of substance in deciduous molars, there is a closing of the bite, the lower incisors slide along lingual inclined planes of upper incisors, eventually in some cases meeting palate of upper. The lower anteriors are in linguoversion, and the uppers after a time are also in linguoversion, due to lip pressure. The heavy overbite changes very much the contour of lower third of face; appearance is given of too much around the mouth, and mouth and chin too close together. In some cases, a congested area may be found around the upper incisors, caused by wrong occlusion of the lower incisors. There may be a condition where laterals are not free to erupt, also a pinching in of upper cuspids. The prevention and removal of causes of the abnormal overbite forms one of the great problems in the work of preventive orthodontia in our schools today. By solving the dental problems as they arise in childhood, especially those of an orthodontic nature, considerable advance will be made towards the solution of other problems now confronting the dental profession.

**Industrial Dentistry.** H. M. Brewer. *The Dental Summary*, 1919, xxxix, No. 6, p. 437.

The National Cash Register Company's Dental Clinic, in Dayton, Ohio, is conducted as a part of their great welfare work. The service is free to all em-

ployees, who are very appreciative of it, and the work is done on the company's time. The work consists of examinations with chart, first aid treatments, extraction of badly diseased teeth or roots, gum treatments, temporary fillings, prophylaxis, consultation, advice and instructions as to the proper care of the teeth and mouth. Estimates on the cost of dental work are not given and all work of a permanent nature is referred to the ethical practitioners of the city. A record is kept of all work done in the clinic. Lectures on subjects pertaining to dentistry are given to the employees, also to the children of the employees. The author, who is the dental clinician of the National Cash Register Company finds that the employees are very appreciative of this dental service. The field for industrial dentistry is large and the work does not end in the factory. The messages on mouth hygiene and preventive dentistry will be carried into the home by the employee, and the effect is bound to be far reaching.

The following is the National Cash Register Dental Clinic report for eight months ending January 31, 1919.

Examinations	735
Decayed teeth	2,663
Missing teeth	684
Extractions	817
Fillings	172
Prophylaxis	811
First aid treatments	543
Gum treatments	182
Abscess treatments	24
Miscellaneous	405
Consultation	118
Total	3,807

**Institutional Dentistry (Insane).** F. A. Keyes. *The Boston Medical and Surgical Journal*, 1919, clxxx, No. 4, p. 89.

The author calls attention to the fact that not enough attention has been given in the past to dentistry in public institutions, although proper care of the teeth is extremely important in connection with the welfare of the inmates. The possibilities for improvement in this direction are illustrated by a comparison of conditions as they prevailed among the inmates of the Medfield State Hospital in April, 1915, when they were examined by the author, and the findings on his last examination three years later, in April, 1918, after the most important of his twelve suggestions had been carried out to the letter. This institution has now had a resident dentist for over two years, and this is the only possible way in which the teeth of the inmates of large institutions can receive proper attention. The author's last examination of the patients at Medfield showed the following conditions, in spite of two years' intensive treatment by resident dentists:

Cases of pyorrhea	203
Cases of patients needing extraction	160
Cases of acute alveolar abscesses	0
Patients with carious teeth	41

Patients in need of full upper dentures	166
Patients in need of full lower dentures	49
Patients in need of both upper and lower dentures	301
Number not examined	6
Cases needing cleaning	426
Wearing plates	89
Cases of stomatitis	5

The amount of dental work still to be done in the Medfield State Hospital, where resident dentists have been appointed, following the author's suggestion, and with great resulting improvement, plainly indicates the existence of gross neglect on the part of institutions which have not as yet employed a resident dentist.

This important contribution is based upon the author's personal knowledge of dental conditions in one of the largest Massachusetts institutions and upon conclusions drawn after careful study of conditions indicated in health reports of superintendents and trustees of others.

**An Interesting Case of Acute Alveolitis Maxillo-Dentalis, Commonly Known as Pyorrhea.** W. A. Lurie. *The American Dentist*, 1919, viii, No. 12, p. 4.

The roentgenograms in the case of a woman twenty-seven years of age, all of whose teeth became very loose and painful after an attack of influenza, showed an alveolar process of greater porosity than usually seen in a patient of her type and age. It was apparent also that the alveolar process was undergoing an acute absorption in places; this was more defined about the loose teeth, where the absorption was not so regular or circumscribed as in chronic cases of alveolitis dentalis, but had a rather ragged appearance. The author suggests that roentgenograms of the long bones would perhaps have portrayed a corresponding porosity there. In order to stop the acute absorption of mineral salts from the jaws, general treatment was distinctly indicated, and the patient was accordingly placed on a high calcium content diet, with internal administration of calcium lactate and intermuscular injection of sodium cacodylate. General hygienic treatment was instituted, and special attention was directed to the mouth. At the time of the report, while it is too early to note any positive results in this case, the patient is more comfortable and the mouth less painful than since the onset of the trouble, during which the upper centrals and laterals became so loose that they had to be extracted. Bicuspids in the upper jaw were loose, but not in so bad condition as the centrals. In the lower jaws the centrals and laterals were also the most loose of any of the teeth, but the teeth in the lower jaw did not seem to have suffered as acutely as those in the upper.

**The Importance of Dental Service in the Hospital.** A. Crocker. *The Modern Hospital*, 1919, xii, No. 5, p. 328.

The author emphasizes the necessity of dental service along with medical service in healing systemic disease, pointing out that work for the dental de-



partment of a hospital is furnished by maternity cases, children's teeth, and cases in which arsenic, iodides, mercury or phosphorus are prescribed. Facilities for difficult extractions under anesthesia and for scientific research are also afforded by a hospital dental clinic. Besides this hospital dental work, research work in dental pathology and dental bacteriology can and should be carried on in connection with cases presented at the hospital. In the Cincinnati General Hospital, for example, patients arriving for diagnosis and treatment are taken to the dental clinic at the direction of the attending physician. "After instrumental examination of the teeth, the dental clinician sends the patient to the x-ray department for a complete dental roentgenographic examination. Ten films are taken, five upper and five lower, covering the complete mouth. One of the large machines is used on a two and one-half spark gap. The developed films are returned to the dental department, and together with the clinical report thereon, sent to the attending physician with the dental recommendations for the case. The dental diagnosis along with the attending physician's diagnosis of symptoms and other tests, such as urinalysis, bacteriologic, etc., make up the case history, which is kept on an indexed chart or card."

Dentistry in the hospital has shown its value in so many ways, and so many patients arriving at the hospital require dental care, that the department is very much in demand. Part of every day is devoted to the care of children's teeth at the Cincinnati Hospital, and oral surgery is performed for all patients requiring attention of this kind.

**The Need of Dental Care in Hospitals.** W. Cl. Adams. *Medical Sentinel*, 1919, xxvii, No. 5, p. 833.

The author points out that every hospital should have on its staff a wide-awake, competent dentist, whose duties should include consultation with the attending physicians and aid in diagnosis, as often by locating the source of infection in the mouth, many a needless operation may be and has been avoided. He should insist on the use of the x-ray for any suspicious teeth and hidden pyorrhea pockets, and above all, he should be able to give a proper interpretation of the radiograms. The hospital dentist's duties would include the performance of various emergency operations, the preparation of the patient's mouth before operation, also the instruction and supervision of the nurses in oral hygiene for the patients. The hospital should be equipped with dental engine and all other apparatus necessary for emergency operations of all kinds. The importance is emphasized by the author of cooperation between physician and dentist, particularly in diagnosis. Treatment for pyorrhea alveolaris and oral abscess is in great demand now that the medical profession has recognized the necessity for correction of conditions in the mouth. The time will soon come when no physician's diagnosis will be considered complete until the condition of the mouth has been thoroughly investigated by a dentist who is thoroughly competent. In the army, no hospital unit was complete without its quota of dentists, and while the majority of the army dentists were not called on to perform any but the most commonplace operations, those who had the necessary

special training in oral surgery accomplished wonderful results in plastic surgery and reconstruction of faces.

**X-Ray Examination in a Case of Dentigerous Cyst in Connection with the Third Mandibular Molar.** W. Ashley Cooper. *The British Dental Journal*, 1919, xl, No. 11, p. 410.

Examination of a woman twenty-three years of age, with a swelling on the left side of the mandible, showed the third molar to be missing, although the other three were normally erupted. The swelling was rounded and extended from the first premolar to about half-way up the ascending ramus, involving the whole of the bone in this region. It was quite hard except just behind the second molar (the roots of which on extraction were found to be absorbed) where fluctuation could be detected. X-ray examination showed the third molar situated very near the angle with one of its roots penetrating the under surface of the mandible. On opening up the cyst under a general anesthetic, the tooth was found to be very firmly implanted in the remaining bone, and a double dislocation occurred which was easily reduced. On examination the tooth was found to have four roots, situated in pairs, internal and external to the arch, the inner surfaces of which were deeply grooved in such a way that the inferior dental nerve and artery passed through, showing that these must have been forced almost to the outside of the mandible. After the extraction of the tooth, which took about fifteen minutes, the cyst was scraped and packed with gauze.

**Dental Roentgenology.** L. M. Martin. *The Texas Dental Journal*, 1919, xxvii, No. 6, p. 3.

In order to obtain a successful roentgenogram, the direction of the rays when possible must be at right angles to the long axes of the teeth, and the sensitized film or plate must be as nearly parallel with the teeth as it is possible to get it. The properly made roentgenogram will reveal with almost mathematical exactness the location of a bony process, the size and amount of tissue involved, but it makes no claim toward determining the exact etiology or whether the process is acute or chronic. When periostitis, osteomyelitis, osteosarcoma or alveolar destruction from pyorrhea is present, the well-made and properly interpreted roentgenogram will not only determine their presence, but will show the extent of the tissue destroyed. Any change resulting from disease or injury in the bony structures is easily determined by a properly made roentgenogram.

In the intra-oral method of roentgenographing the teeth, small sensitized celluloid films are used, which may be securely held against the lingual side of the teeth by the patient himself. The position of the patient and the direction of the central rays are of the greatest importance. Misconceptions frequently arise from distortions caused by taking the pictures from wrong angles. The shadows of the teeth may be greatly broadened and shortened, or lengthened and narrowed, by changing the angle at the time of exposure. In narrow mouths it is frequently impossible to keep the films from bending considerably when held

against the gums and teeth. One or more of the teeth as shown in the film may appear to be distorted, because of such a bend. Although x-ray negatives of all teeth may be obtained by the intraoral method, it is as a rule more practical to make plates of the lower molars, bicusps, and often cuspids. For this purpose, sensitized glass plates in assorted sizes are commonly used. Some degree of distortion is unavoidable with the extraoral method, on account of the almost inseparable difficulty of bringing the plate near to and parallel with the teeth, moreover, a very slight movement of the patient's head will make the plate worthless, unless the lesion is a very large one. With the intra-oral method, slight moving of the patient will not be noticed in the film. In a study of the lower molars, both methods may often be used with splendid results.

In a well-made roentgenogram of the head it is interesting to note the radiolucency of the parts occupied by the sinuses; in normal individuals, the frontal, ethmoid, sphenoid, and maxillary sinuses are clearly delineated. If obstructed, filled with pus or otherwise diseased, the normal density will be changed to a varying degree. When an abscess exists at the root of a tooth, the radiolucency is changed in the area involved and a dark shadow is recorded on the plate. By radiolucency is meant a state of offering but slight resistance to the roentgen rays, according to the nomenclature adopted by the American Roentgen Ray Society in 1913.

### **The Findings of the X-ray. Editorial. Oral Hygiene, July, 1919, ix, No. 7.**

The prevention of disease is today the great object of both medical and dental professions. Until quite recently all dentists were agreed as to the value of correct dental service, but with the advent of the x-ray there has come a serious questioning and a division of opinion among the profession.

It has been found that the x-ray picture, due to distortion and vagueness of outline, is in many cases most unreliable and, as one writer expresses it, "half a bet and half a guess." The correct interpretation of the film requires greater skill than the photographing.

The medical profession in their obstinate cases have not failed to diagnose the trouble as of dental origin and have ordered the removal of bridges and the extraction of teeth. This without consulting the dentist and, in many cases, without an x-ray examination. In other cases the patient under treatment has gone to the dentist and he, finding an ulcerated tooth or teeth, persuaded the treatment of it without results. The patient is disgusted with the treatment of the physician, and has no faith in the dentist.

We are prone to tell of our success in the treatment of these cases and say nothing of our failures. The truth is that many cases are treated to the best of our ability and refuse to clear up. The treating of the teeth is without apparent benefit. A case in point is that of a patient of the editor who was suffering from rheumatism so much that she had her knee in a plaster cast and was going about her work on crutches. The upper teeth were extracted and a most satisfactory denture inserted. On the lower jaw was located a bridge, one abutment of which was swinging back and forth in a pool of pus. The other teeth were badly infected. When it came to having them out the patient

objected and said she would rather die than have a lower plate. She persisted in her refusal but, strange to say, after a short time discarded her plaster cast and her rheumatism disappeared entirely. Had she consented to the removal of the lower teeth and the substitution of an artificial denture, nothing could have convinced us but that the extracting of the teeth was the cause of her recovery. Perhaps it may be argued that the removal of the diseased teeth in the upper jaw was enough to swing the balance and make her recovery possible.

Men are practising dentistry with the loss of confidence that they are doing the best thing for the patient, and with the advent of the x-ray this has been intensified. We are passing through a stage of doubt which the medical profession has faced for years. Undoubtedly the time will come, perhaps not in this generation, when we will have settled down to the mode of practice that is accepted as for the best interests of the patient. Until that time we must be content to go ahead and use our best judgment and trust in the future that this will be justified.

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## EDITORIALS

### The N. D. A. Meeting at New Orleans

ORTHODONTISTS should plan now to attend the next annual meeting of the National Dental Association at New Orleans from the 20th to the 24th of October. The meeting will of course be a great success. Many papers bearing directly and indirectly on orthodontia will be presented.

He who visits New Orleans at the end of October, when the members of the National Dental Association are scheduled to gather in that interesting Southern capital, will have a feast for the eye as well as a delight for the mind. Here the eighteenth century shakes hands with the twentieth, and, as in some of the charming old capitals of Europe, there is but the need of a score of steps to turn back the pages of time a couple of hundred years. Resistant to the inroads of progress, the old structures have remained, the Cabildo, for example, in which

sat the Spanish councillors who made the laws for the province of Louisiana. Here was consummated the purchase of the Louisiana territory, now divided into more than a dozen states of the Union, and in the main "sala" the representatives met whose principles were Napoleon Bonaparte and Thomas Jefferson. It is a fitting use for such a historical edifice that the Louisiana State Historical Society holds its sessions in the great hall. Beside the Cabildo stands the Cathedral, which at the moment is nearing its centennial.

In the old quarter, the French section, the relics of days of long ago persist. Here are the close-shuttered, balconied houses, which have a history of slavery; there is the quiet paved street with its ancient houses, in touch with the present day by the sign, "One-Way Street," while on every hand there is the romance of a tropical, out-of-doors, flower-embowered city. Quaint archways lead from the streets, through which one catches glimpses of domestic life, the well-nourished Southern "Mammy" in the shade of the soft-hued wistaria or the more florid courtyard with its reminders of former beauty. Here a fountain splashes in the filtered sunlight, there a bed of posies gleams in the brilliance of noon, above a balcony tells perhaps the story of some local Juliet, while luxuriant shrubbery, roof of tiles, shuttered windows and the presence of flowers, breathe picturesqueness and antiquity,—the peculiar charms of this ancient quarter of this old city.

New Orleans in its picturesqueness and its famous welcome to visitors calls for a record meeting, one worthy numerically of representing the great National association of dental practitioners that is to assemble there.

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### Fishing Will be Good at New Orleans

**M**EMBERS of the National Dental Association fond of fishing had better bring their strongest rods and reels to New Orleans when they come to the national convention, October 20-24. The waters surrounding New Orleans are teeming with edible fish from the aristocratic and palatable pompano and mackerel to the plebian and coarser textured catfish and chopique.

"Spend your vacation in New Orleans in October," is a slogan the general convention committee has adopted in urging members to be here for the big meeting. It is understood many will follow this plan. The Indianapolis delegation, coming nearly 100 strong, have announced they intend to fish and enjoy life generally. This does not mean they will pass up the convention; they intend to take to the great outdoors after the meeting is adjourned.

October is an ideal fishing month around New Orleans. The city is surrounded by lakes, bayous, passes, and other forms of water easily reached by railroad. All of the fishing resorts boast clubs at which fishermen can obtain live bait, tackle, food, motor launches and other things that go with a day on the water.

Steps have been taken by the State Conservation Commission to preserve fishing for the whole state; this does not mean that fishing is restricted. These

rules apply principally to commercial fishing, the sportsman having ample leeway to catch as many as he likes.

In addition to the speckled trout, red fish, buffalo, drum, croakers and sheep-head, the waters abound in sharks and tarpon, the latter measuring all the way from 2 to 6 feet and weighing from 10 to 200 pounds. The tarpon feed on mullet, lying in wait two feet under the surface until a school appears overhead. The tarpon then jumps and splashes, killing mullet right and left. This provides his feast.

As all fishermen know, the tarpon is a fighter, and many are the memorable battles that have been staged in Louisiana waters. The guide of the Winchester Club at Lake Catherine, only a few miles from the city, has for a trophy a tarpon measuring 6½ feet. He landed the monster in twenty minutes with ordinary reel and rod.

When it comes to fish stories, nearly every sportsman in New Orleans can spin them. For instance, Doctor Joseph P. Wahl, general chairman of the local committee, recently visited Mississippi Sound where he caught five red fish averaging five pounds in about five minutes.

"They were grabbing the hook before it hit the bottom," he declared.

Not to be outdone, another member of the committee told how he caught a number of 15 pound drums off Deere Island, a famous government game preserve.

One of the favorite methods of fishing is to "bait the hole" the night before. Clams usually are used for this, the bait attracting sheepheads. One fisherman who recently visited Chef Menteur baited a hole the night before and went out early next morning. He caught 30 sheepheads weighing all the way from one to five pounds.

Among the famous fishing holes within a few minutes ride of the city are Lake Pontchartrain, the Rigolets, Lake Catherine, Little Woods, Chef Menteur, South Point, Biloxi, Pass Christian, Bay St. Louis, Ycloskey, Mandeville, Milneburg, Spanish Fort, West End, Lake Borgne and other places too numerous to mention.

New Orleans, the largest sea food market in the world, also is famous for its oysters. It has been said (by visitors) that the oysters sold in New Orleans have a much richer flavor than the famous Chesapeake Bay product. However, this is a point for discussion among oyster consumers.

Soft shell crabs, frogs, shrimp, clams and hard shell crabs are plentiful in New Orleans and occupy a prominent place on all menus. Those who like sea food will make no mistake by coming to New Orleans whether they are able to go out and catch it or not.

"They'll be bitin', boys; come along," is the word the local committee sends out.

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## ORIGINAL ARTICLES

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### VARIATIONS AND MODIFICATIONS OF THE FACIAL FEATURES: AN INTRODUCTORY STUDY\*

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BY B. E. LISCHER, D.M.D., ST. LOUIS, MO.

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THE study of the factor of variation, by which we mean dissimilarity between organs or qualities that are homologous, has led to the concept that variations are of germinal origin, or congenital. Modifications, on the other hand, are wrought in an individual's lifetime, are somatogenic, or acquired.

It is a matter of ordinary observation that every human face presents lineaments of character which stamp it with individuality; probably no other part of the body shows so marked a tendency to variation. Under normal conditions, the various features of the face frequently combine in so harmonious a manner that they reveal a striking symmetry. It is "actually a very wonderful and animated piece of architecture, full of beauty and inspiration for one who looks upon it with a seeing eye and considers its age-long evolution with a comprehending and sympathetic mind."

The variations of the facial features have been carefully examined by students of physical anthropology and continue to attract an increasing number of well-trained investigators. Their methods of inquiry have reached a high degree of development and constitute a highly specialized technic. Thus, photographic and x-ray studies, geometric drawings, plastic reproductions, instruments of precision, comprehensive record sheets, statistical and graphical methods of presentation are all employed.

The denture of man is a very complex mechanism and its structural units and adjacent tissues frequently exhibit *variations* and *modifications*. The history of the teeth, as explained by comparative odontology with the aid of fossil remains, is one of the most complete and interesting narratives that science has ever told; very few departments of knowledge can present a section of the past

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\*Read before the Alumni Society of the Dewey School of Orthodontia, St. Louis, Mo., March 6-8, 1919.



quite as completely. But like many other organs of the body, the teeth have not escaped the enervating influences which our changing diet and modes of life have imposed through centuries of time. The anomalies of dentition have, of course engaged the attention of dentists from time immemorial; but the modifications which these produce in the facial features of man have not been analyzed with the painstaking care which their importance merits. It seems to me that this subject offers a large field for original investigation to orthodontists, because they are qualified by training and opportunity for research in this realm.

Blumenbach (1775), Camper (1792), and Prichard (1836) were the pioneers in the study of the relation of the teeth and jaws to the facial lines of man. Since then, numerous methods for measuring human features have been sufficiently standardized to win universal acceptance.

In his work on "The Races of Europe," Ripley adopts the rule: "Long head, oval face; short head and round face. In proportion as the head becomes broader back of the temples, the face appears relatively shorter. Only a few examples of widespread disharmonism, as it is called, between head and face are known. Among these are the Greenland Eskimos, notwithstanding the fact that they are almost the longest headed race known. The aborigines of Tasmania are also *disharmonic* to a like degree, most other peoples of the earth showing an agreement between facial proportions and those of the head which is sufficiently close to suggest a relation of cause and effect. In Europe, disharmonism is very infrequent among the living populations. At times disharmonism arises in mixed types, wherein the one element contributes the head form while the other persists rather in the facial proportions. Such combinations are apt to occur among the Swiss, lying as they do at the ethnic crossroads of the continent."

In comparing a number of skulls even the beginner experiences little difficulty in detecting differences of shape. "The form of the head is for all racial purposes best measured by what is technically known as the *cephalic index*. This is simply the breadth of the head above the ears expressed in percentage of its length from forehead to back. Assuming that this length is 100, the width is expressed as a fraction of it. As the head becomes proportionately broader—that is, fully rounded viewed from the top down—this cephalic index increases. When it rises above 80, the head is called *brachycephalic*; when it falls below 75, the term *dolichocephalic* is applied to it. Indexes between 75 and 80 are characterized as *mesocephalic*.

The list of variations of the bony structures of the head is quite a long one and the following are mentioned because of their special interest to orthodontists. 1. Variations in the degree of projection of the teeth and jaws in relation to the facial form, which may be determined in crania by means of the *gnathic index*. Measured in this manner, the races of man may be classified into the *prognathic*, *mesognathic* and *orthognathic* types. 2. Variations in the size of the teeth are grouped into *macrodont*, *mesodont* and *microdont*. 3. Variations of alignment into *parabolic*, *hyperbolic*, *elliptic* and *U-shaped* type of dental arches. 4. Variations in the development of the symphysian angle of the chin, which are termed *protruding*, *straight* and *receding*.

The diet of an aborigine differs widely from that of a highly civilized

caucasian and exercises such a marked influence on the muscles of mastication that modifications in the position of the temporal ridge, the width of the ascending rami and the angles of the mandible are readily recognized.



Fig. 1.



Fig. 2.



Fig. 3.

In a general way, the size and form of the head and face of man are conditioned largely by the bony structures to which the soft parts are attached, but there are many variations of the latter which can not be regarded as dependent upon the former. Let us briefly consider a few of these, especially of the lips and oral fissure. Variations in the length of the upper lip may readily be classified into the *long*, *medium* and *short* types (Fig. 1). Viewed in profile, we may also recognize the *protruding*, *straight* and *receding* forms, to which the terms *procheilia*, *orthocheilia* and *opisthocheilia* are applied (Fig. 2).



Fig. 4.



Fig. 5.

The length of the oral fissure differs widely, when measured from cheilion to cheilion, and the variations thus observed may be grouped under the *long*, *medium* and *short* types, or *macrostomia*, *mesostomia* and *microstomia* (Fig. 3). The mucuous membrane, or vermillion border, of the upper and lower lips shows a constant tendency to variation into the *narrow*, *medium* and *wide* types (Figs. 4 and 5). Large lips may be called *macrocheilia* and small lips *microcheilia*.

As orthodontists, we are particularly interested in those modifications of the facial features which are caused by anomalies of dentition. For conven-

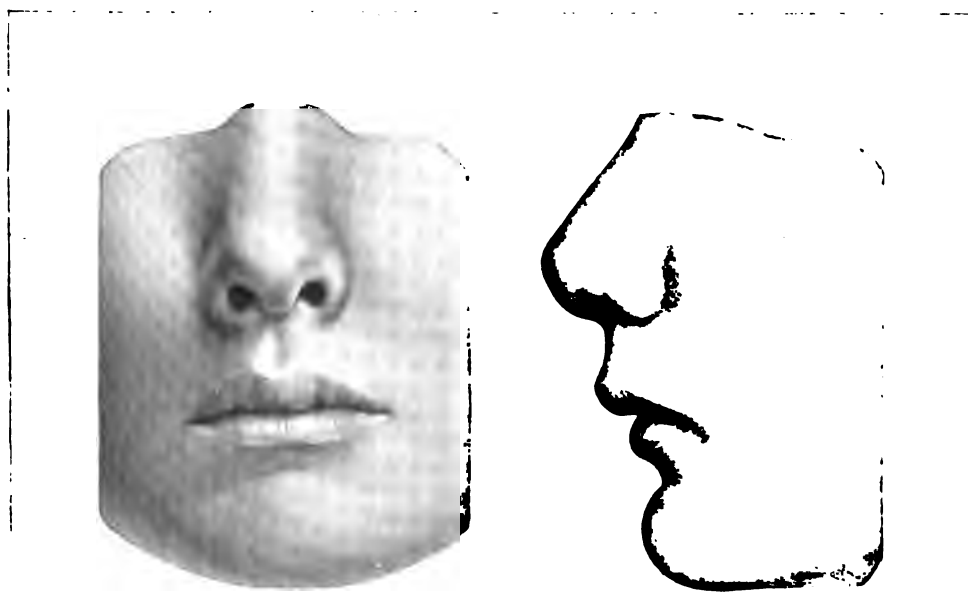


Fig. 6.

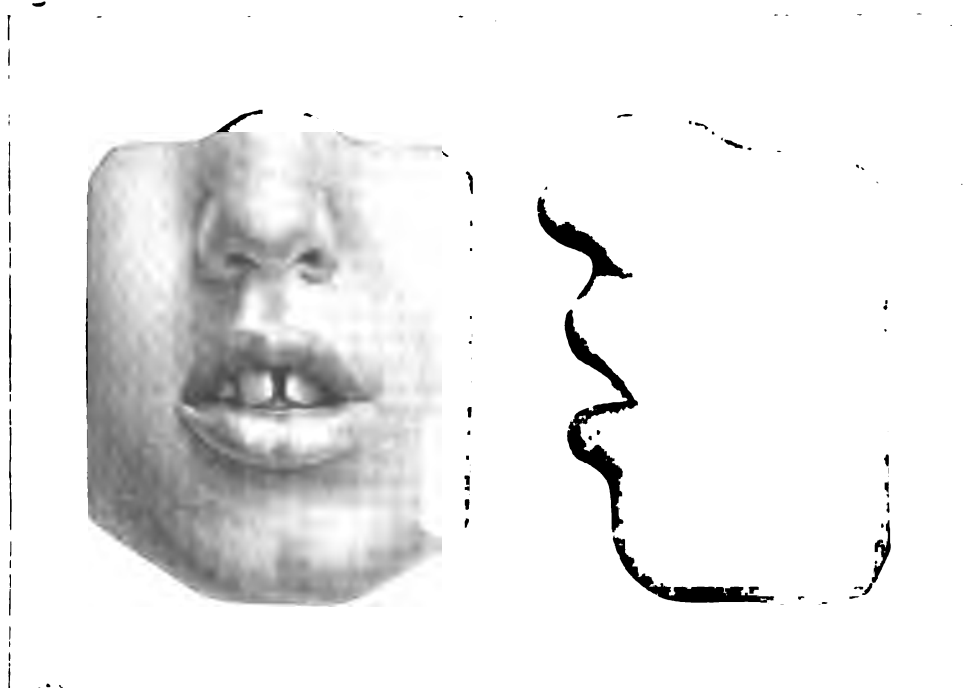


Fig. 7.



Fig. 8

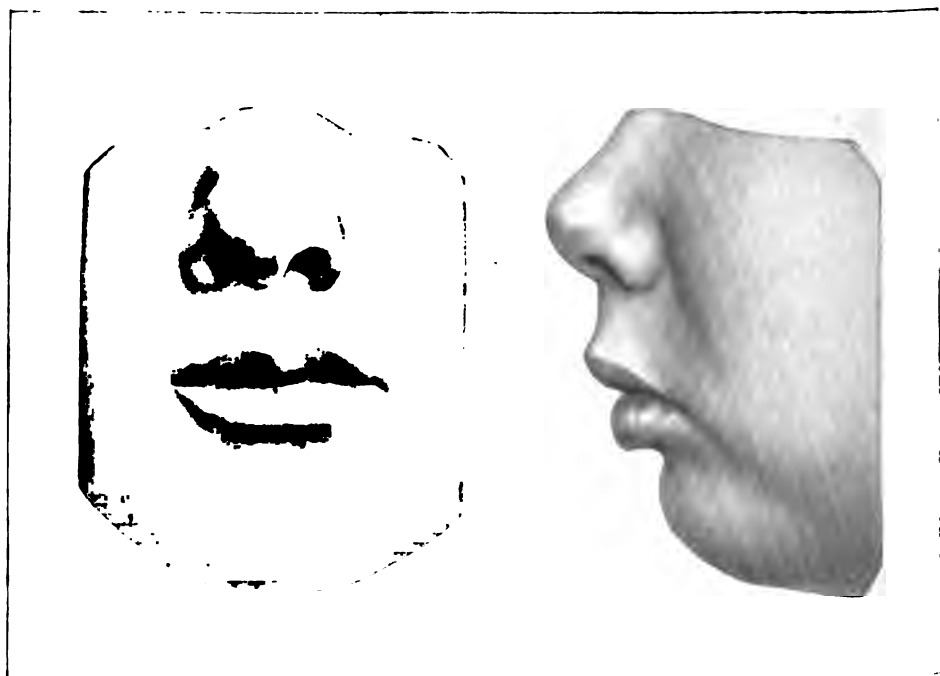


Fig. 9.

ience we may classify these into (a) malrelation of the lips, (b) malfunction of the lips, (c) malformation of the lips and (d) malformation of the jaws and their processes.

*Malrelation of the lips* may or may not be associated with malfunction and malformation (Fig. 6). In its simplest form it is most frequently found in distoclusion not complicated by mouthbreathing. The dental arches in these cases are more symmetrical in form, though malrelated, and extreme malposition of the anterior teeth is absent.

*Malfunction of the lips* is usually associated with extreme malposition of the incisors and arrest of development of their surrounding alveoli. It is common even in young patients with mixed dentures, and in neutroclusion and distoclusion complicated by nasal obstruction (Fig. 7).

*Malformation of the lips* (Fig. 8) is the ultimate result if the above-mentioned modifications are neglected and permitted to continue indefinitely. It is always a serious condition and may be found as a complication in many forms of dentofacial deformity.



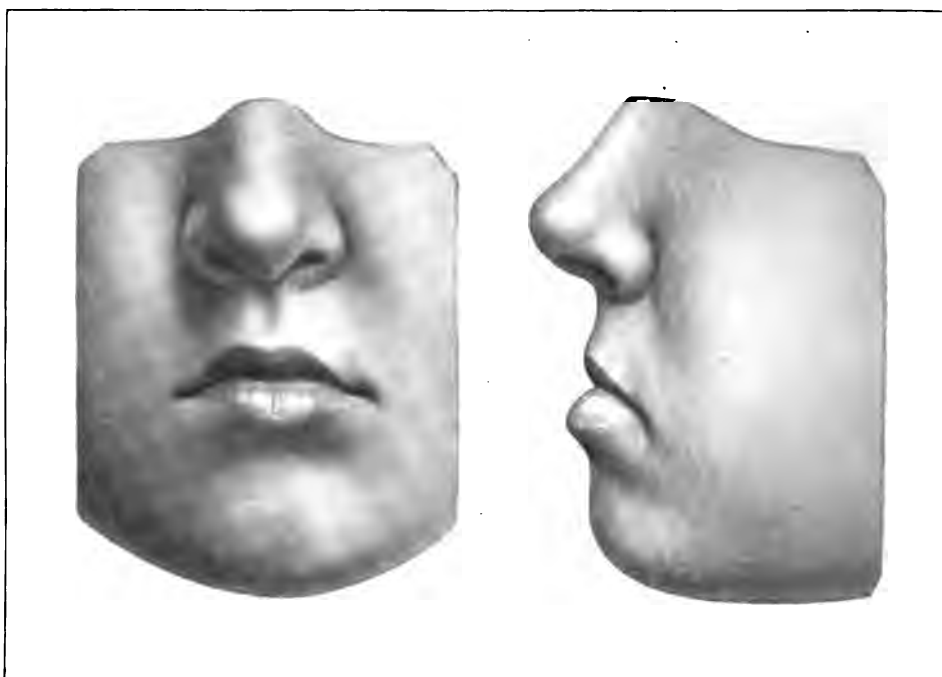
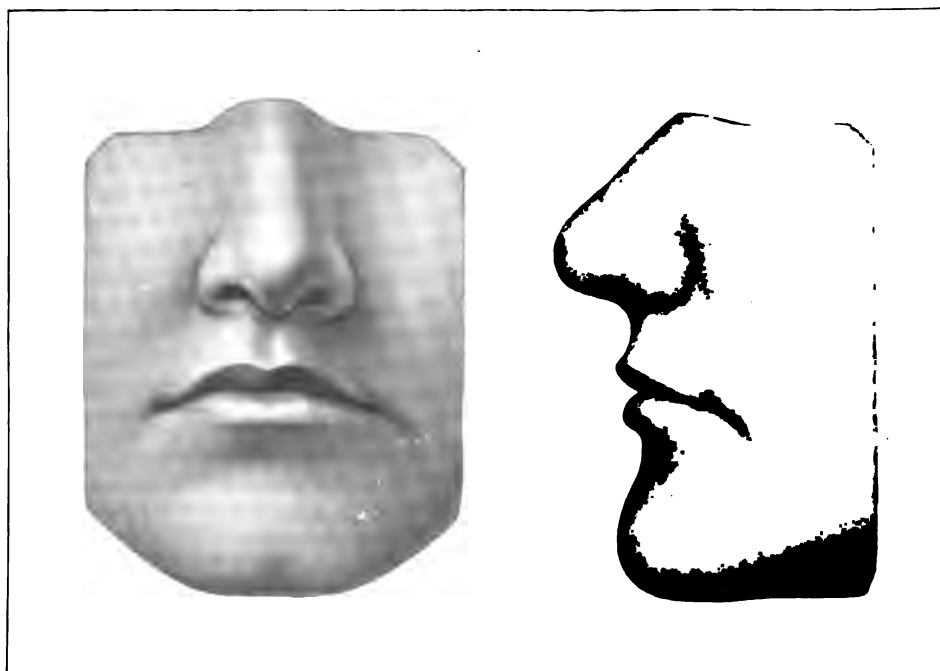
Fig. 10.

*Malformation of the jaws and alveolar processes* are fortunately less frequent. They constitute the most difficult lesions with which we have to deal and present a variety of facial modifications. In some of the younger patients with large lips the latter may continue normal functions (Fig. 9); in others, the deformity is so extreme as to involve a number of features so extensively that full correction becomes impossible.

The relation of the *stomion*, or lip line, to the occlusal plane, varies widely among individuals; and in patients presenting dentofacial deformities extreme modifications may occasionally be observed (Fig. 10). All orthodontists of experience have undoubtedly observed this, but thus far it has not been described.

In conclusion, the author offers a very brief consideration of the main facial modifications in *complex neutroclusion*.

Linguoversion of the maxillary incisors is a common complication and results in an easily recognized malrelation of the upper lip (Fig. 11). A thorough

**Fig. 11.****Fig. 12.**

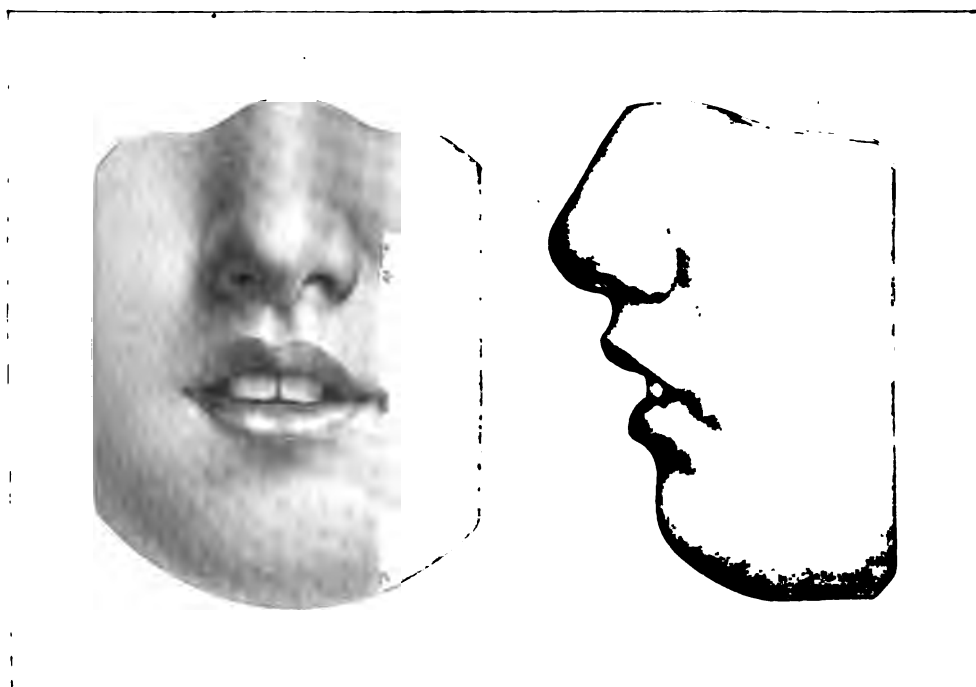


Fig. 13.

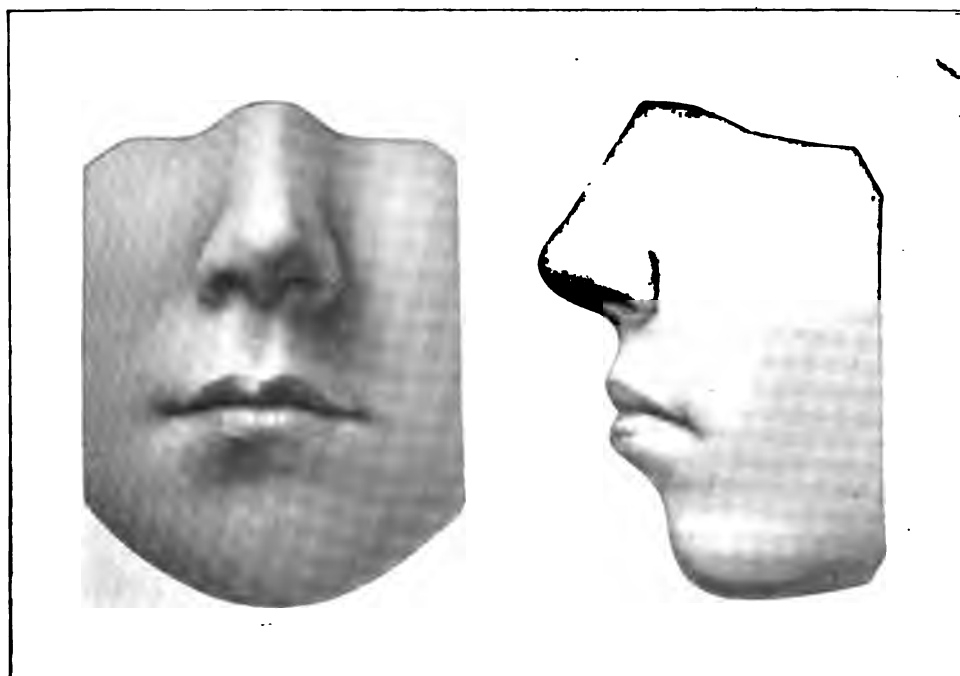


Fig. 14.



study of this modification will reveal many striking deviations. A further complication arises when the mandibular incisors also erupt in linguoversion, with the resultant facial modification differing very considerably from the former (Fig. 12).

Labioversion of the maxillary incisors produces a facial modification of a distinctly different type, and may present malfunction and malformation of the lips. Nasal obstruction and mouth-breathing are common complications (Fig. 13). Arrest of development in the upper lip and the receding type of chin are sometimes combined in the same patient and constitute a very serious deformity.

Labioversion of the mandibular incisors is very rare, but when combined with labioversion of the maxillary incisors a prognathic facial type results (Fig. 14).

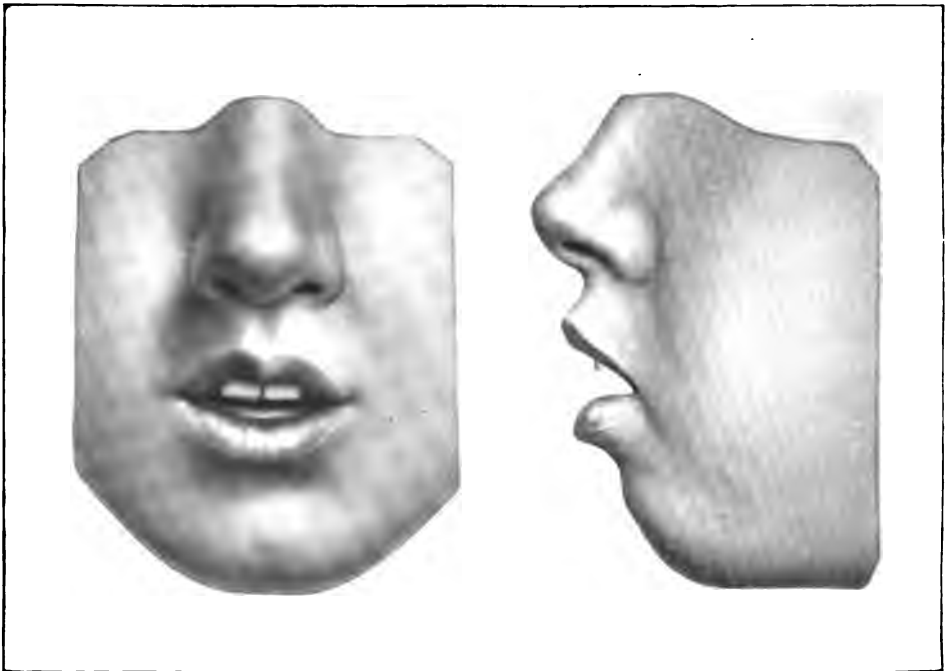


Fig. 15.

Infraversion of the anterior teeth results in a facial modification that differs from any of the foregoing (Fig. 15).

I have given the subject of this paper a great deal of consideration, but this short sketch has been hastily written at the last moment, and amid other pressing duties. It is offered as a mere introductory study in the hope that it will arouse your interest in an important phase of our work.

One or more of the variations and modifications enumerated above may occur in practically every kind of dentofacial deformity. They combine in a great variety of ways and their classification, and the recognition of their sequence and relative significance, is a task for the future.

## DISCUSSION

*Dr. A. C. Gifford, Oshkosh, Wis.*—I believe we can consider ourselves fortunate in having Dr. Lischer bring this subject before us, as I know the majority here have not placed enough importance upon facial art in orthodontics.

One must first be an artist and second have made an extensive study of the variations of facial outline to classify the modifications found in these days of intermarriage of races. This brings about the alteration of head form to such an extent that we find very few true to type features. This intermarriage of races and modern civilization seem to have created a law for each individual, therefore, any fixed type can not now be established as was the case in the time when the Greek face of Apollo Belvedere was the basis or standard. The pleasing physique of our American Indian, with its fine balance, can no longer be found, as it has also succumbed to modern civilization.

Dr. Rogers, of Boston, controls the facial malformations by exercise to develop the muscles and their attachments. He has shown that the muscles of expression and mastication can be developed to the extent of correcting modified features. Dr. Angle has said that the best balance, harmony, and proportions of the mouth in relation to the other features, requires a full complement of teeth, and that each shall occupy its normal position.

There is that stage in the life of a person which shows many modifications and variations, that is, from the time the first temporary teeth are lost until the permanent canines have fully erupted. The features depend almost wholly upon the normal eruption of the teeth, if the face is to develop into the greatest harmony.

*The President.*—This is a very important paper and the author has brought out a great many points that we should be very much interested in, and I think the paper should be freely discussed. It is now open for general discussion.

*Dr. E. G. Weeks, Saginaw, Mich.*—I would like to ask Dr. Lischer one question. What does he do with those cases of short upper lip in adult patients, illustrations of which he has shown, and how does he correct them?

*Dr. Milo Hellman, New York City.*—It is very difficult to follow attentively the reading of a paper of this sort and discuss it in an intelligent manner, but I would like to say a few words touching upon one or two points.

In the first place, I would say that Dr. Lischer ought to be a little easier in expounding these theories because many of them have been contradicted in recent investigations. It is true, they have been accepted by many anthropologists, but recently biologists and ethnologists have not shown any disposition to accept them *in toto*. We ought, therefore, to hesitate before making statements of a definite and positive character.

The point Dr. Lischer mentioned with reference to the ascending ramus,—that it is a structure due to habit or to function—

*Dr. Lischer.*—To diet.

*Dr. Hellman.*—remains to be proved. The various races prove definite racial characteristics with reference to the ascending ramus. We have an extremely short and broad ramus in the Eskimo, while we have a long, narrow, comparatively delicate and graceful ramus in the American Indian. The anthropoids show a very broad ramus resembling that of the Eskimo, and our primitive predecessors show similar characteristics to those of the Eskimo and the anthropoids; so that it may be an evolutionary characteristic and not a functional acquisition. I am rather more inclined to attribute it to evolutionary processes.

The relationship between the width of the face and the width of the skull may be found to be dealt with in an interesting manner by Mr. L. R. Sullivan of the American Museum of Natural History of New York in an article on the subject of "Physical Anthropology and Orthodontia" to which he has devoted a good deal of study. It was published in the *Dental Cosmos*, April, 1918, and is of great interest to those acquainted with the subject of anthropology. He bases his deductions on very noteworthy evidence.

As to the face itself, I wish to recommend a very good paper written by Prof. Wm. K. Gregory of the Columbia University, N. Y., on the "Evolution of the Human Face." In that paper he goes through the entire evolutionary process, bringing forward some very interesting evidence bearing on this topic. He presents not only the evolution of the bony struc-

tures, but also the correlative development of the nervous and muscular systems of the head and face, laying some stress on the evolution of the special senses.

I would strongly advise those who are interested in this subject to look up the article of Professor Wm. K. Gregory of Columbia University on the "Evolution of the Human Face," *American Museum Journal*, October, 1917. An abstract of that paper was printed in a recent issue of the *Dental Cosmos*.

*Dr. Martin Dewey, Chicago, Ill.*—I was very glad to hear Dr. Lischer make a distinction between variation and modification. Environment has much to do with modifications. As regards certain variations in facial development and certain modifications, one must make a careful analysis to see which is which, to determine what has been congenital and what has been the result of environment. Under the head of modifications, you have to consider such conditions as may arise as the result of abnormal development from various sources, and then the other modifications which will be influenced by use. For instance, as regards the short upper lip it may be the result of disuse. One will find it almost always associated with mouth-breathing. We find the thickened lower lip which may be the result of irritation produced by the lip resting against the upper teeth.

In the different varieties and shapes of the mandible, in the development of the chin, we find the chin is claimed by some comparative anatomists to be the result of the development of the organs of speech, because man has a better development of the chin than anthropoids. In certain cases the development of the chin is associated with malocclusions; it may be that the under development is the result of the abnormal use of certain muscles rather than a variation. We find the extreme difference in the development of the mandible in distocclusion as compared with mesiocclusion. In the mouth-breather you have a receding chin, while in the normal individual you have a well-developed mandible and a more or less prominent chin. As a result of that, we must not lose sight of the fact that function plays a very important part in the development of the lips, and in the size and shape of the lips, which may be changed by various muscular efforts as shown in a paper presented by Dr. Rogers before the American Society of Orthodontists last year.

In regard to macrodontic, mesodontic, and microdontic races there is no question that the human family can be classified according to the size of the teeth; but again, we have to be very careful in considering that in connection with our patients because a macrodontic condition will resemble one with tooth development of normal size where the rest of the face is not developed. Because the individual presents seemingly macrodontic teeth, there is no reason why he had large tooth germs when born. We have small jaws in many cases because the conditions which produce underdevelopment of the jaw will not cause a lack of development in the size of the teeth. The conditions which influence the supporting structures will not influence the size of the teeth because the latter was worked out before the individual was born. As soon as the enamel organ is formed the size of the teeth is established but the size of the jaw is not determined, and consequently, if anything interferes with the development of the jaws, we may have a patient with seemingly too large teeth for the face.

Dr. Lischer called attention to the inharmonious conditions which may arise in connection with one type of face and one type of cranium and skull. That hardly looks possible because we find existing types and variations in animals where the variation occurs as a result of inherited conditions, and it has reference to types. For instance, the offspring will take the characteristics from one parent or from the other parent, or there may be a blending of the two. If, for instance, the offspring takes the cranial type of one parent and takes the facial type of the same parent, there will not be a mixing up of these different types of faces and craniums any more than mixing up other parts of anatomic structures. But there is no question that there is as close a relation existing between modifications of the face as influenced by malocclusions; and modifications in the shape of the face as influenced by function. We have different shapes of the lips as inherited conditions which can be exemplified again by considering the lips as you find them in the negro, and the upper lip which you find in the Irish races which is so well portrayed by artists. Often the short lip is not because of the inherited condition, but because of

lack of function, and so we have to be careful to give more study to this phase of the subject before we make a diagnosis depending on what is the result of variation and what is modification, and what is lack of function.

*Dr. Max C. Ernst, St. Paul, Minn.*—It is always interesting to listen to a paper by Dr. Lischer, and that is one of the reasons I am here today.

As he was reading his paper I was reminded of an incident in St. Paul. I was attending a meeting of the Ramsey County Medical Society and was sitting near the secretary. A paper was read and the secretary said to me, "That must have been a very fine paper, but I didn't understand a thing about it." (Laughter.)

I shall look forward with a great deal of pleasure to the publication of Dr. Lischer's paper, so that we can all read it very carefully and see its true merit. I hope the slides will be published in connection with the paper.

If Dr. Lischer got his paper up hurriedly, I suppose most of us ought to be very glad he didn't put much time on it.

*Dr. George F. Burke, Detroit, Mich.*—I hope when the essayist closes the discussion he will discourse on the subject of suitable exercise for the undevelopment of the lips.

A great many thoughtful men in this special field think that Dr. Rogers presented a subject that has a great deal of merit in it, and a great many men have obtained considerable out of his papers and illustrations, but it seems to me, he would have rendered a much more valuable service in what he has done if he could have presented his technic with the method. His technic could have been presented to great advantage, and it would have been of tremendous educational value to the profession—at least to those who feel that there is merit in this whole proposition of muscle exercises. It is pitiful in the extreme, after having moved a tooth into normal occlusion, particularly in severe cases of distocclusion, to find the upper lip is still short and undeveloped.

I would like to ask Dr. Lischer whether in his opinion a systematic form of exercises will to a considerable degree increase the functional activity of these parts.

*Dr. Lischer (closing).*—Dr. Weeks and Dr. Burke spoke about the short upper lip and what I did in such cases. I do not want to convey the idea of presenting some new remedy. I merely wanted to call your attention to some observations I have made and to some of the difficulties that have confronted me in my experience. Up to a very recent time I did not think anything could be done for deformed lips except by surgical operation, as outlined in the work by Kollé, of New York. Of course, the suggestions of Dr. Rogers, of Boston, are very encouraging, and I hope will lead to something very definite. I understand he is to present a paper before the American Society of Orthodontists next week; so that we shall probably get further instruction along this line. That offers a ray of hope for dealing with some of these modifications.

Dr. Hellman intimated that some of the theories advocated by anthropologists are of questionable value, and Dr. Dewey spoke about the theory of disharmonism. These have been current in anthropologic literature, which shows that anthropologists have recognized these facts. I do not care what theory you favor as to the cause of a particular variation or modification, but the fact is that it exists, and we have to deal with it.

The point to which I wanted to call attention in my paper, and I had to do it briefly, is that up to the present time most of us have looked upon these facial modifications as *by-products*, which we frequently claim to be able to correct; but we do not study them in a thorough manner, though it is clearly one of our duties. I photograph every patient that applies for treatment, and it is astonishing to note the many surprises such photographs reveal if they are indexed and properly classified. You will notice modifications from time to time that hitherto escaped your attention. It is a good thing to record them in black and white on paper.

If any of you want to take up this work, I shall be glad to help you while you are in our city.

So far as muscular exercises are concerned, I have nothing new to offer.

## HISTORY OF ORTHODONTIA

(Continued from page 398, Vol. V)

BY BERNHARD WOLF WEINBERGER, D.D.S., NEW YORK CITY

**E**DWARD HARTLEY ANGLE, M.D., D.D.S., D.Sc., Founder of *Modern Scientific Orthodontia*. Provost Smith upon conferring of honorary degrees at the dedication of the Thomas W. Evans Dental Institute, 1915, expressed the following tribute to our great teacher, in words that can hardly be improved upon, broad in their meaning and true in their statement: "Lover of art and nature, intimate friend of trees and flowers, but pre-eminently founder of the science of orthodontia, to which the best thought of a life has been given in experiments and in test."

To Dr. Angle orthodontia owes that renewed impetus this great thinker has instilled into our science. Probably no one man in dentistry did more to foster



Fig. 1.—Edward Hartley Angle, M.D., D.D.S., D.Sc.

this branch of dental science causing its separation from the general practice, bringing about the specialization and advancing it to a recognized science.

The first to incorporate in his teachings and writings, the views of Davenport and others, publicly emphasizing that extracting of the teeth in order to correct malocclusion was unnecessary and even criminal; the importance of restoring normal occlusion in order that the best results might be obtained and the teeth permanently retained.

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Dr. Angle read his first paper in December, 1886, *Irregularities of the Teeth*, before the Minneapolis Dental Society, repeating this before the Minnesota State Dental Society in May, 1887, and then describing for the first time (in a paper read before the Ninth International Medical Congress, 1887) what is now recognized as the "Angle System." From this simple beginning there has developed that which we now recognize as the leading method of treating irregularities of the teeth. Seven editions of his *Malocclusion of the Teeth* have gone through the press, the last published in 1907, the first in 1887. The second *A System of Appliances for Correcting Irregularities of the Teeth*, 1890. The third, *The Angle System of Regulating and Retention of the Teeth* appeared in 1892 and the fourth edition was issued in 1895 with a second part *Treatment of Fractures of the Maxilla*, fifth edition in 1899, while the sixth *Malocclusion of the Teeth and Fracture of the Mandible* in 1900. Each edition was more comprehensive than the preceding one and contained all of the advances made by the author in the intervening years. The first five editions were pamphlets, the sixth, however, was more of an elaborate work, in this he clearly sets forth at length his method of operating, the devices he designed and their method of construction, with the added advantage of numerous photographic reproductions of models showing various cases before and after treatment, thus greatly enhancing the value of the work. The seventh edition brought out in 1907, a work of 628 pages, was the last published in English. This edition has been reprinted several times. Besides the English editions there have appeared at least three German translations. The last being a revised edition of the seventh, with the addition of the working retainer and the pin and tube appliance.

In the *American Textbook of Dentistry*, third and fourth editions, Dr. Angle wrote the chapter on *Orthodontia*, the last issued containing his more recent appliance.

Dr. Angle's works have been translated into the French, German, Dutch, Scandinavian and Spanish languages.

The greatest influence in fostering orthodontia and advancing its science was undoubtedly the establishing of the *Angle School of Orthodontia* in 1900, the first postgraduate school for the teaching of this branch of dentistry and medicine and the training of selected men to advance scientific orthodontia. From a small group of men, four in number, *Henry E. Lindas, Thomas B. Mercer, Herbert A. Pullen* and *Milton T. Watson*, the graduates now number more than one hundred and fifty men who later located in every large city in this country as well as in Europe and South America. Dr. Angle was actively at the head of ten sessions of his school.

#### ANGLE SCHOOL OF ORTHODONTIA

Dr. Angle was the first man to realize that orthodontia and general dentistry were radically different and constituted in reality separate specialties of medicine—dentistry being the study of the diseases of the mouth, orthodontia the study of the relationship of the teeth to the development of the face. To him it was not a part of dentistry, but a sister profession.

Dr. Angle has told in his own words the condition which led up to the establishment of the Angle School and I will include that, as it was given by him—

self. But one who has looked at orthodontia only from the view of dentistry, can not, I believe, understand this development.

"In 1880 I had become very much interested in orthodontia, and I came to believe that some time, perhaps after a long time, orthodontia would be practiced as a specialty, for it seemed to me that its importance entitled it to a closer study and application in practice and that only would enable any one to become sufficiently familiar with its principles and master its technic, to overcome its difficulties and be successful in its practice. This conviction has constantly grown upon me in the years that have followed.

"In 1896 I advocated its teaching and practice as a specialty in a paper read before the Western Pennsylvania Dental Association, which was published in the *Dental Review*. My experience in teaching orthodontia in four different dental colleges, covering a period of thirteen years, convinced me that it was impossible ever to successfully teach it to dental students. This is abundantly proved, I think by the fact that although orthodontia has been a part of the curriculum of all the dental colleges from *Harris'* time down, not one dental student in all that time has gained sufficient knowledge of the subject in the dental college to enable him to practice it with sufficient success to make it his sole means of gaining livelihood, in spite of the immense number of these deformities in every community.

"I then tried hard to impress the management of the dental departments of the Northwestern University and the University of Pennsylvania with the desirability of their forming special departments devoted exclusively to the study and practice of orthodontia. I proposed that orthodontia in these institutions should be made optional; those having an aptitude and liking for the work, giving after the second year, their entire time to its study and practice. The answer was, always, 'This is too Utopian,' or 'It is too early.'

"Having become entirely discouraged with my experiences in dental colleges, I became filled with the belief that if orthodontia was to make any material progress, a separate school, entirely independent of dental schools, must be formed, which would amply provide opportunity for those with aptitude and liking for the subject to study in a broad, thorough and comprehensive manner, and where it would be relieved from all the blighting, handicapping influences which are necessarily thrown around it in dental colleges. Hence was founded the Angle School of Orthodontia."

"In the summer of 1899, at the meeting of the National Dental Association at Niagara Falls, a few young men became very much interested in Dr. Angle and his idea of orthodontia. As a result of the interest awakened, four young men, *Drs. Thomas B. Mercer, Henry E. Lindas, Milton T. Watson, and Herbert A. Pullen*, went to St. Louis and spent about three weeks with Dr. Angle in his office." This was the very humble beginning of the Angle School of Orthodontia.

In 1902 Dr. Angle strongly advocated the separation of orthodontia from the general dental profession and making it a distinct specialty, thus fulfilling *Dr. Farrar's* prophecy. For some years previous he devoted his practice exclusively to orthodontia and by the training the men received in his school this branch has now become a distinct specialty of its own.

One of the important factors in advancing Dr. Angle's "System" undoubt-

edly is the classification devised by him and now accepted as the recognized standard in treating malocclusion of the teeth. This classification, with his determined stand against extraction of teeth, will be a lasting memorial to him. This is based upon the different varieties of malocclusion, taking the "constancy of the upper first molar" as a guide, the various types of cases being placed in four groups, and for each group there is prescribed a definite line of treating. This classification has brought a chaotic condition into an orderly and scientific arrangement, best testified by its generally universal acceptance and adoption throughout the whole dental profession. A brief summary of *Dr. Angle's* development of his system is as follows:

The introduction of metal tubes soldered to the band, 1886, providing a "simple, compact, and ready means of attachment between band and working appliance."

*Irregularities of the Teeth*, (Ninth International Medical Congress) 1887, probably First Angle Edition.

Introduction of *Nickel Silver* (German) in 1887.

Introduction of *Traction Screw* in 1887.

Introduction of *Stationary Anchorage* in 1887.

Introduction of first set of *Angle's Appliances* in 1889.

Introduction of *Silver Solder* in 1890.

*A System of Appliances for Correcting Irregularities of the Teeth*, Second Edition, 1890.

Introduction of *Occipital Anchorage* in 1891.

Introduction of *Occlusal Anchorage* in 1891.

*The Angle System of Regulation and Retention of the Teeth*, Third Edition, 1892.

Introduction of *Adjustable Clamp Band*, in 1892.

Introduction of *Angle Impression Trays*, in 1894.

Introduction of *Soft Brass Ligature Wires*, in 1895.

Introduction of *Wire Pinches*, *Under a New Method of Applying Force in Regulating Teeth*, in 1895.

*Fourth Edition of the Angle System of Regulation and Retention of the Teeth*, with an addition of *Treatment of Fractures of the Maxillæ*, in 1895.

Introduction of the *Band Forming Pliers*, in 1898.

*Fifth Edition of the Angle System of Regulation and Retention of the Teeth, and Treatment of Fractures of the Maxillæ*, in 1899.

Introduction of *Resection of Frenum Labii*, in 1899.

Introduction of *Head Gear*, in 1899.

Introduction of *Chin Retractor*, in 1899.

Introduction of *Classification of Malocclusion*, in 1899.

Introduction of *Friction Sleeve Nut*, in 1899.

*Malocclusion of the Teeth*, Sixth Edition, 1900.

Introduction of *Establishing of the Angle School of Orthodontia*, in 1900.

*Some Basic Principles in Orthodontia*, in 1902.

*Metal Ligatures in Orthodontia*, in 1902.

Introduction of *Specialization of Orthodontia*, in 1902.



Introduction of *Normal Occlusion*. The full complement of teeth, and that each tooth shall be made to occupy its normal position, in 1903.

Introduction of *Upper First Molar as a Basis of Diagnosis*, in 1905.

*Malocclusion of the Teeth, Seventh Edition*, 1907.

Introduction of *Working Retainer*, 1910.

Introduction of *Pin and Tube Appliance*, 1911.

Introduction of *Ribbon Arch*, in 1913.

Notes on Orthodontia with a *New System of Regulation and Retention*. This paper by Dr. Angle was read before the Ninth International Medical Congress in 1887, in which he says:

"In this brief paper I shall confine myself to the consideration of movements of the teeth during treatment, and, later on, shall offer for your consideration some appliances for accomplishing these movements and the retention of the teeth when in proper position. In studying the conditions by which we may best accomplish the movements of the teeth, we may simplify matters if we remember the movements are but five, viz., forward and backward in the line of the arch, inward and outward in the line of the arch and partial rotation. These and their slight modifications (with the exception of elongation and depression, which are so rarely necessary that I will not here speak of them) are all we are called upon to perform. The principles governing all of these movements are the same, so that by understanding the principles governing one we may comprehend them all. Only one of these movements by means of a mechanical appliance should be undertaken at the same time, otherwise the liability to inflammation is greatly increased. After having moved a tooth the desired distance in one direction, it should be firmly stayed from retrogression, when other movements, if desired, may be accomplished. In accomplishing a movement of a tooth by force, it matters little whether the pressure be continuous or intermittent, since the results are the same. The movements of a tooth should be completely under the control of the operator, and should be fast or slow, as his judgment may dictate, system and accuracy being observed at every step. And perhaps no one of the mechanical powers so nearly fills the requirements in aiding the operator in this respect as the screw. It is powerful and compact and the many different ways in which an ingenious operator may make use of it renders its application almost universal, and it may nearly always be used inside of the arch, thus avoiding the appearance of unsightly appliances. Next in value I should place the spring composed of piano wire.

"In applying force to a tooth, it should be sufficient to accomplish the movements as rapidly as is consistent with the laws of physiology.

"When pressure is once applied, it should continue without relinquishment, for there should be no retrogression of the tooth. Indeed, I attach so much importance to this fact that I believe that it may be laid down as a law in orthodontia, for I believe the frequent removal of pressure is contrary to the laws of physiology, and when occurring, as by slipping, breaking appliances, frequent adjustment of ill-designed appliances, or for purposes of cleansing or changing of appliances, is the cause of nearly all the soreness and pain; and, I may add, a

very common cause of failure in regulating. And to this cause, directly, I believe, may be traced strangulation and death of the pulp, which is so often attributed to the too rapid movement of a tooth.

"An appliance for accomplishing the movement of a tooth should be so perfect in design, construction, application and operation that there should be no occasion for its removal until the object for which it was designed is accomplished.

"In the movement of a tooth, it is necessary that the resistance, at the point from which pressure is exerted, should be sufficient to completely overcome the resistance of the tooth being moved, but the regulating appliance should never be allowed to rest in contact with the gum, as no substantial resistance can be gained by so doing, and more or less inflammation will be the result.

"The practice of covering the crowns of the molars or bicuspid with metallic caps or vulcanite, thereby preventing the proper closure of the jaws, is unnecessary, and should be deprecated."

#### RETAINING APPLIANCES

"On this subject little has been given us, and to this question far too little importance is attached. After the malposed tooth has been moved into the desired position and proper occlusion secured, it should be firmly supported and retained in such position until it has become firm in its socket.

"A retaining appliance should hold the tooth so firmly that there will be no movement to disturb or in any way interfere with the new bone formation. Absolute rest is essential to the most speedy and satisfactory results. The importance of a firm support and rest while the tooth is becoming firm, is well illustrated, says *Guilford*, in the necessity of placing a fractured limb in immovable splints.

"I greatly doubt if alveolar tissue, formed under unfavorable circumstances (such, for instance, as would obtain in malocclusion, or in the use of appliances necessitating frequent springing in and out of place for the purpose of cleansing) would, on close examination, be shown to be normal.

"A retaining appliance should remain stationary until the object for which it was designed is accomplished; at the same time it should be clean, and in no way irritating to adjoining tissues, as it must of necessity be worn for a long time.

"The rotating appliance, a piece of piano wire about two and a half inches in length, is bent at one end into the form of an eye. It is shown in Fig. 2. Rotation by the means of this instrument is accomplished by banding the tooth to be rotated in the usual manner. Before cementing the band in position on the tooth, a piece of joint wire (the bore of which is exactly the size of the piano wire just described), one-fourth of an inch in length, is soldered to the band on the buccal portion, at right angles to the axis of the tooth. The band is now cemented in position on the tooth. The straight end of the piano wire is inserted into the little tube, the other end sprung around and made fast by means of wire ligatures to the tooth nearest the eye. Fig. 2 shows an incisor tooth being rotated by this method. After the tooth has been moved into the desired position, it is retained in such position by moving the spring and inserting a

piece of gold-plated wire into the tube from the opposite side, long enough for the end to rest on the labial surface of the tooth adjoining, as shown in Fig. 2. For accomplishing the movement of a tooth from within outward into line of arch, the jackscrew is used in the following manner: The tooth to be moved is banded and piped, in the manner just described in rotating. Into the palatal side of the band is formed a slot, into which is inserted the flat end of the jackscrew. Resistance for the base of the jackscrew is gained by selecting a sufficient number of teeth to completely resist the pressure of the moving tooth. These teeth are banded in the usual manner and piped, close to and on a line with the gum, and a piece of gold-plated wire is threaded through these little pipes, either before or after cementing the bands in position. Against this wire is placed the base of the jackscrew. Fig. 3 shows the screw in position

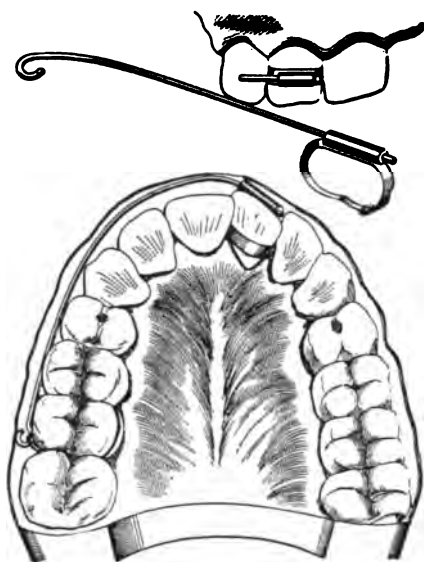


Fig. 2.—Means of rotating anterior teeth (1887).



Fig. 3.—Upper, Retaining appliance; Lower, Use of jackscrew.

in moving an inlocked canine. Force is applied by tightening the nut with a small wrench.

"After the tooth is moved into the desired position, it is secured and firmly held in such position by passing a short piece of the gold-plated wire through the little tube previously soldered to the labial or buccal portion of the band, the wire being long enough for the ends to rest upon the labial or buccal surface of the tooth on each side. Thus the tooth is effectually keyed into its new position, as shown in Fig. 3.

"The movement of a tooth from without inward into the line of the arch is accomplished by banding and piping the tooth to be moved, the pipe resting to and on a line with the gum on the palatal side. The angle of the traction-screw is hooked into the pipe. Resistance is gained by banding, piping and wiring together (either gold or piano wire may be used) a sufficient number of teeth in the arch to overcome the resistance of the tooth being moved, the traction screw and nut drawing through and against a short piece of the joint wire

soldered to the wire of resistance on a line with the screw. Fig. 4 shows the screw in position in moving a central incisor. After the tooth is moved into the desired position, it is retained by removing the angle of the screw from the pipe and slipping into its place a short piece of the plated wire, the ends resting against the palatal surface of the tooth on each side, as shown in Fig. 4. The movement of a tooth backward in line of the arch is accomplished by



Fig. 4.—Traction screw.



Fig. 5.—Bringing cuspid into line.

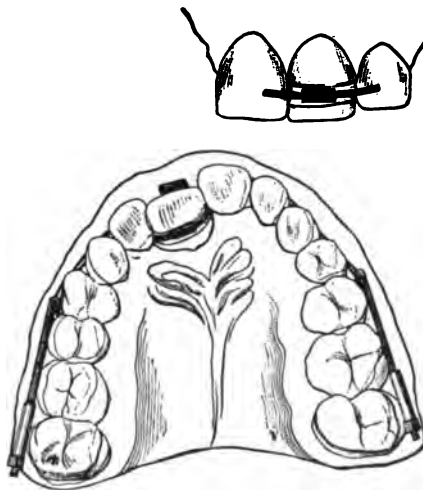


Fig. 6.—Traction screw used to move an "inlocked incisor" into position.

banding and piping the tooth to be moved (for example, a canine) same as for rotation; a suitable tooth for resistance is selected (for example, second molar), banded and piped, the pipe being soldered to the band on a line with the axis of the tooth. Into this pipe is hooked the angle of the traction screw. (A longer

screw than the one first described is used, but of the same gauge.) The screw is passed through the pipe in the tooth to be moved and the nut applied. Fig. 5 shows appliance in position. The nut is tightened as often as necessary, and the screw, as it passes through the nut and becomes irritating to the lips, is snipped off. After the tooth has been moved back the desired distance, it is retained in such a position by the screw already in position, or the screw may be removed and the plated wire inserted in its stead.

"The movement of a tooth forward in line of the arch is accomplished in the same way, only selecting a tooth of resistance from the opposite side. Such are the general ways of using these appliances, but the different ways in which they may be applied are almost limitless, each case requiring some slight modification. Fig. 6 shows the manner in which the traction screw may be used in moving into line an inlocked incisor, at the same time expanding the arch.

"The ligature represented by a dark line in the drawing is composed of fine steel wire annealed. Fig. 7 shows the method in which the arch may be expanded by using two short jackscrews soldered to heavy pieces of brass wire

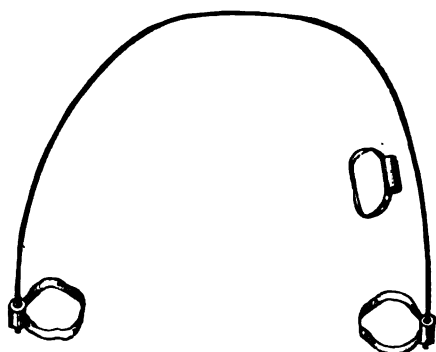


Fig. 7.—Expansion arch (1887).

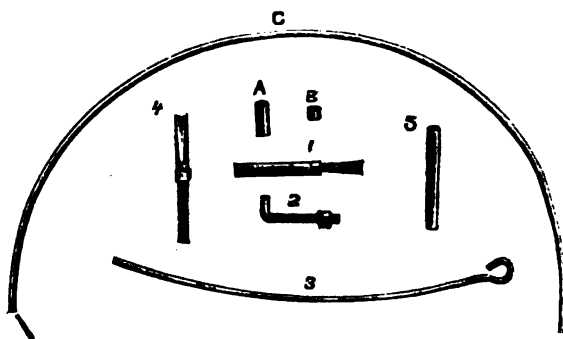


Fig. 8.—Original set of "Angle Appliances" (1888).

bent to conform to the shape of the palatine arch. The screws in this case are about one-quarter of an inch in length; after the nut has been tightened until the screw is nearly passed over it, it is removed and the bent portion of the heavy brass straightened or drawn out, in order to gain more purchase for the screw. Only one of these appliances is removed and straightened at a time, the other one remaining in position in order to prevent retrogression of the teeth being moved.

"In conclusion, let me add, the greatest care and accuracy should be observed in the construction, application and use of these appliances. The little tubes should be of gold and fit snugly the different parts of the appliances passing through them, and if you will derive as much satisfaction in using them as I have, I shall feel abundantly repaid."

Extracts of this paper were also published in the *Ohio Journal of Dental Science* and *The Items of Interest* for 1887.

In the January, 1888, number of the *Ohio Journal of Dental Science* under *The Angle System of Regulation and Retention* we find a continuation of the above article with a few additional illustrations.

"In former numbers of the above Journal I gave the main principles of my system for correcting irregularities. I now propose to report from time to time cases in practice, illustrating more fully the application of the principles of this system." One of these reports is found on page 123 of the 1888 *Ohio Journal of Dental Science*. Another on page 306. The following illustrations are from these reports and describe themselves.

"Fig. 8, original set of Angle Appliances.

"Fig. 9 shows a cuspid being drawn backward.

"Fig. 10, means of expanding the posterior maxillary arch, as described by Angle:

"The opposite ends resting against the bars of steel; expansion is gained by tightening the nut on the screw. A better method of applying pressure against these two bars is to bend a piece of heavy steel wire to conform to the curve of the

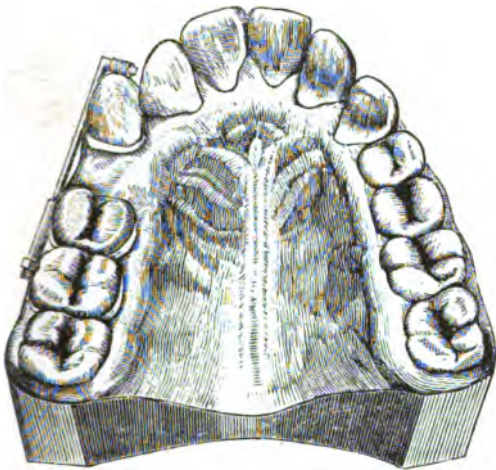


Fig. 9.—Moving cuspid into line (1888).

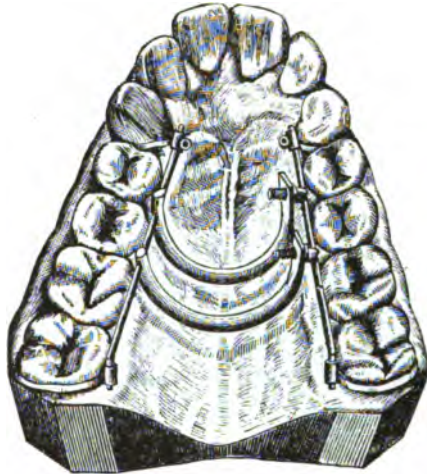


Fig. 11.—Fig. 10 applied.

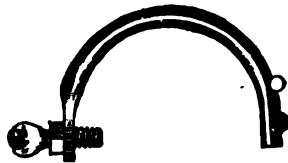


Fig. 10.—Expanding posterior maxillary arch (1888).

arch across from bar to bar. At the side near one end is filed a notch fitting neatly one of the bars which it is to rest against. The other end is beaten slightly flat and a hole drilled through at a point directly opposite the other bar on that side of the arch. Through this hole is placed a screw for pushing as shown in Fig. 10. The screw should not be over  $\frac{1}{4}$  of an inch in length. This appliance is now ready to place in position as shown in Fig. 10. It is in position in Fig. 11. Pressure is exerted by tightening the nut. After the nut has traveled the length of the screw, the bent wire is removed and straightened a little that the screw may have more action.

"It will be seen in the engraving that the two of these screws and braces are used, one is to remain in position while the other is being straightened, thus preventing the teeth from moving back, as would be the case if but one was used. The braces are moved along the bars forward or backward according as pressure is needed. After the sides of the arch have been pressed apart the de-

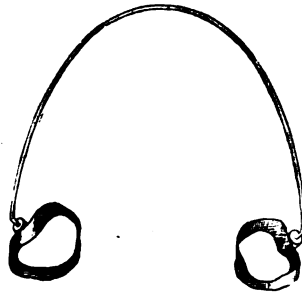


Fig. 12.—Retaining arch.

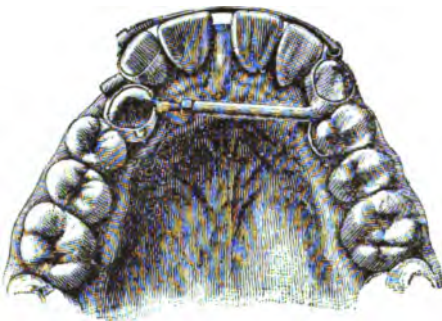


Fig. 13.—Expanding in cuspid region.

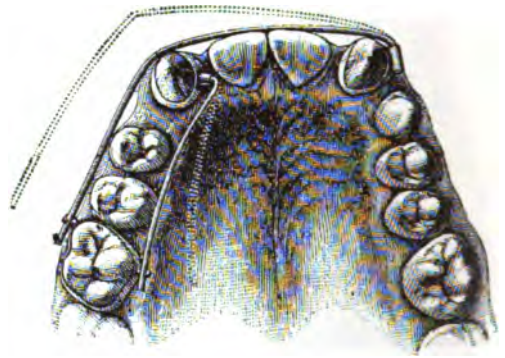


Fig. 14.—Rotating teeth (1888).

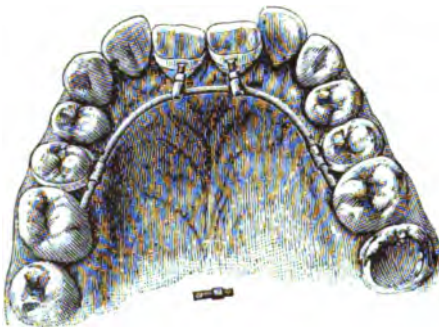


Fig. 15A.—Bringing forward the anterior teeth.

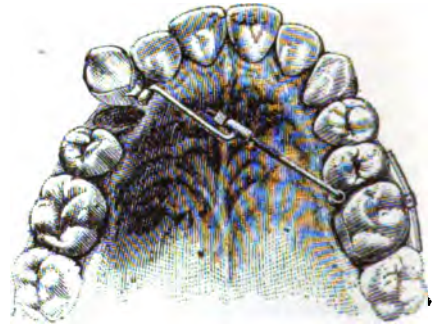


Fig. 15B.—Use of traction screw.

sired distance, they are retained by a straight bar passing across the arch from cuspid to cuspid, the ends being bent sharply at right angles and hooked into pipes already described and attached to bands encircling the cuspids. The incisors are drawn into line by means of the traction screw, this cross bar serving as the wire of resistance for the traction screw to pull to.



"This method of expansion may be applied to the lower arch as well, as little interference is offered to the movement of the tongue."

Fig. 12 shows the retaining arch as used by Angle at that time.

Fig. 13 is an appliance described on page 123 of the above journal.

Fig. 14, means of rotating teeth.

Fig. 15, method of bringing forward the anterior teeth.

The *International Dental Journal*, 1889, page 323, contains another of the early articles of *Dr. Angle's* Regulating Appliance. The case in question was one of Excessive Protrusion.

"The value of the occipital bandage, as a means of anchorage is, I believe,

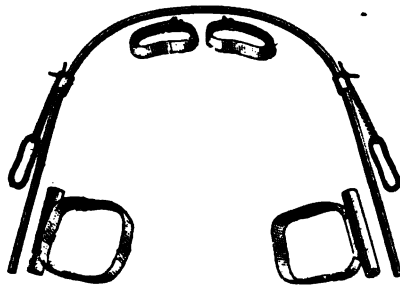


Fig. 16.—Appliance as used in 1889.

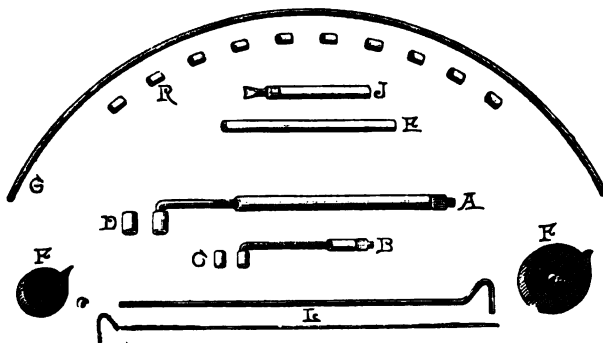


Fig. 17.—Second set of "Angle Appliances."

becoming more and more appreciated, and is especially applicable to this class of cases. I am using the appliance herein described, in my sixteenth case, and I consider it much more satisfactory than any of the few devices which are described in our literature on this subject. This is shown in part in Fig. 16.

"It is made and applied as follows:

"The first molars are carefully and accurately banded. These bands may be made of gold or platinum; but what I regard much better than either, on account of its tensile strength, is German Silver, rolled to No. 36 gauge, shown in *F* in Fig. 17.

"Little pipes about five-eighths of an inch in length are soldered on the side of the arch to the bands. A wire of *hard drawn* platinized gold, about No. 19 gauge, and long enough to encircle the arch is now carefully bent to conform to the shape of the arch, if the arch be correct in form; but if it be contracted or



the teeth irregular, no attention is paid to the form of the existing arch, but an *ideal arch* for the case is made by bending the wire arch to the exact shape to which we wish the teeth in the arch to arrange themselves when the operation is completed.

"The ends of this ideal arch are now slipped into the pipes on the molars. The anterior part of the arch is kept from sliding up and impinging upon the gum, by resting in suitable niches formed in the delicate bands encircling, and cemented to the central incisors.

"It will also be seen by referring to this cut that two small pipes or collars have been slipped on the wire arch, and are shown in the region of the cuspids. (Also shown at *R* in Fig. 17.)

"These collars are prevented from slipping by being previously soldered into place, care being taken to use *soft solder*, that the temper may not be drawn



Fig. 18.—Head cap (1889).

from the wire arch. The collars are for the purpose of preventing the silk ligatures shown in the cut from slipping backward on the wire. These silk ligatures serve to attach delicate rubber ligatures, which have been hooked over the ends of the little pipes on the anchor teeth, and are represented in dark lines in Fig. 16. The use of these rubber ligatures will be explained further on. A traction bar is used in conveying the force from the occipital bandage distributing it to the wire arch.

"A spur about three-eighths of an inch in length will be seen in the center of this bar, it has a deep niche in one end, which when in position, is placed in contact with the wire arch, at a point between the central incisors. Heavy rubber bands are now attached to the occipital bandage, the other ends being hooked over the traction bar. Shown in position in Fig. 18.

"If the reader is familiar with the appliance so far described, it will be seen that the force received from the occipital bandage, is distributed to the wire arch practically through a ball-and-socket joint, as the ends of the traction bar may be

moved in any direction without interfering with the pressure from the bandage.

"As for the bandage proper, I greatly prefer the common silk traveling cap, shown in the engraving, or the knit jersey cap, to the contrivance usually used for this purpose, as these fit the head snugly, thereby distributing the force exerted by the strong ligature over more surface, and are consequently more easily worn. Two ligatures should be attached to the cap, one above the ear, and one below, as shown in Fig. 18. If the bands be of equal width, the force will be exerted in the direction of the meatus of the ear."

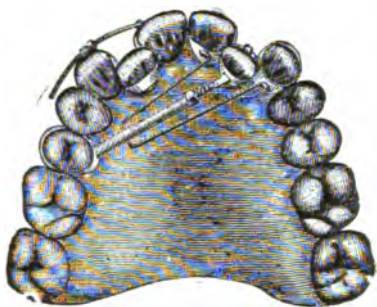


Fig. 19.—Increased anchorage.

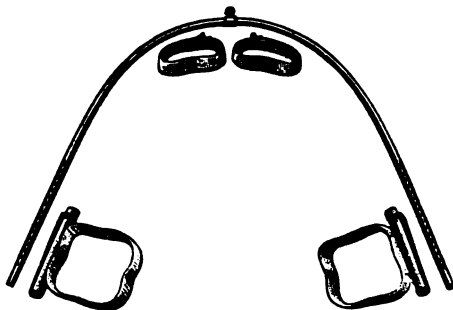


Fig. 20.—Modification of Fig. 16, found in the third edition of Doctor Angle's Book.

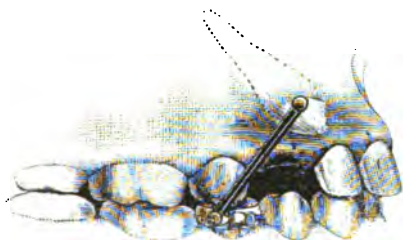


Fig. 21.—Forcible protrusion of nonerupted or partially erupted teeth.



Fig. 22.—Forcible protrusion of nonerupted or partially erupted teeth.

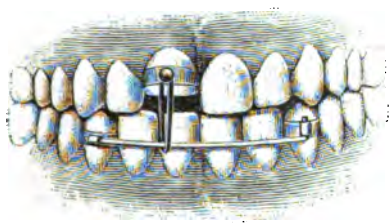


Fig. 23.—Forcible protrusion of nonerupted or partially erupted teeth.

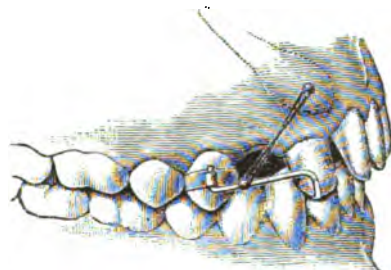


Fig. 24.—Forcible protrusion of nonerupted or partially erupted teeth.

Fig. 19 is from a *Report of Cases in Orthodontia*, 1889, *Ohio Journal of Dental Science*.

Fig. 20 is a modification of Fig. 16 and is described in Angle's third edition.

*Dental Cosmos*, 1891, Forcible Protrusion of Non- or Partially Erupted Teeth. The following four illustrations describe the method Angle then used to bring down these teeth. Figs. 21, 22, 23 and 24.

*Dental Digest*, page 6, 1895, *A New Method of Applying Force in the Regula-*

*tion of Teeth.* Here we find a new method of applying force by means of the *Wire Stretching Pliers*, Fig. 25.

*Dental Cosmos*, March, 1899, page 248, *Classification of Malocclusion.* In this article we find undoubtedly one of Dr. Angle's greatest contributions to orthodontia.

"The term *Irregularities of the Teeth*, as it is usually applied to express teeth that are twisted or unevenly arranged, does not, in the author's opinion, properly express the full meaning of these deformities. It would seem that the term "malocclusion" would be far more expressive; for in studying the subject, we must not lose sight of the importance of the dental apparatus as a whole and the important relations not only of the two arches to each other; but of the individual teeth to one another. The shapes of the cusps, crowns, roots, and the very structure are all designed for the purpose of making occlusion the one grand object, in order that they may best serve the purpose for which they are designed,

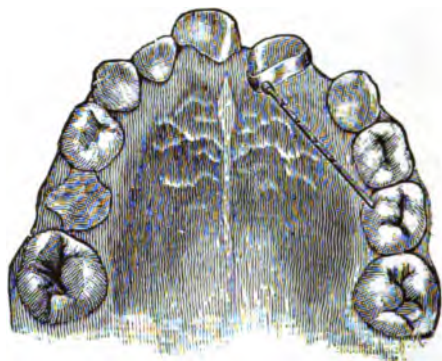


Fig. 25.—Expanding by the wire-stretching pliers.

namely, the cutting and grinding of the food. Examined carefully, it will be seen that there can be no "irregularities" of the teeth if they are in perfect occlusion, but that all must be regular and even, each contributing to the support of the others, and all in perfect harmony. Not only this, but the jaws, the muscles of mastication, the lips, and even the facial lines, probably, will be in best harmony with the peculiar facial type of the individual.

"Therefore, it would seem that the term malocclusion of any tooth or number of teeth would not only better express the true condition, but naturally and constantly suggest the paramount importance of occlusion in the study and treatment of these deformities, instead of making it secondary or even losing sight of it entirely, as has been too much the case in the past. The author has become firmly convinced that occlusion is the very basis of the science, and that in the treatment of cases, unless occlusion is established, the results will be largely of the nature of failures. So in the pages that are to follow we will make occlusion the central thought, and on it base the classification of "irregularities" as well as the nomenclature; and will define orthodontia as being that science which has for its object the correction of malocclusion of the teeth.

"In order to diagnose all cases of malocclusion correctly it is necessary to be familiar with, first, the normal or ideal occlusion of the teeth; second, the normal facial lines. These must be so fixed in the mind as to form the basis from which

to reason, and to intelligently note all deviations from the normal; and it must follow that without clear, fixed, and definite ideas as to the normal, the limits or boundary lines of the abnormal must also be vague and indefinite, and the line of treatment the merest empiricism.

"A knowledge of the occlusion of teeth being the first importance, should embrace a knowledge of not only the normal relations of the occlusal surfaces of both permanent and deciduous teeth, but of their entire forms and structures. The growth and normal development of the jaws and muscles, together with the development of the teeth and the normal periods for taking their positions in the arches, should receive careful attention. Our perceptions of the subject would be broadened also by a comparative study of the occlusion of the teeth of the lower animals."

As this article covers some thirty odd pages it will be impossible to include it in this historical review and fearing that injustice might be done same by reviewing or extracting parts, the author advises that his readers review the article in the above journal or the sixth edition of Angle's book.

There is some slight difference in the wording of the classification as will be seen by comparing the one from the *Dental Cosmos* and the other found in the sixth or seventh edition, and therefore both are included in this historical resume. (*Dental Cosmos*, page 264.)

#### CLASS 1.

Relative position of the dental arches, mesio-distally, normal, with malocclusions usually confined to the anterior teeth.

#### CLASS 2

Retrusion of the lower jaw, with distal occlusion of the lower teeth.

##### Division 1.

(a) Narrow upper arch, with lengthened and prominent upper incisors; lack of nasal and lip function. Mouth-breathers.

(b) Same as *a*, but with only one lateral half of the arch involved, the other being normal. Mouth-breathers.

##### Division 2.

(a) Slight narrowing of the upper arch; bunching of the upper incisors, with overlapping and lingual inclination; normal lip and nasal function.

(b) Same as *a*, but with only one lateral half of the arch involved, the other being normal; normal lip and mouth function.

#### CLASS 3

(a) Protrusion of the lower jaw, with mesial occlusion of the lower teeth; lower incisors and cuspids inclined lingually.

(b) Same as *a*, but with only one-half of the lateral arch involved, the other being normal.

OUT OF SEVERAL THOUSAND CASES OF MALOCCLUSION EXAMINED THE PROPORTION PER THOUSAND BELONGING TO EACH CLASS WAS AS FOLLOWS:

Class 1 .....	692
Class 2	
Division 1 .....	90
Subdivision 1 .....	34
Division 2 .....	42
Subdivision 2 .....	100
Class 3 .....	34
Subdivision . . . . .	8
	<hr/> 1000

(Seventh Edition, page 57.)

Class 1. Arches in normal mesio-distal relations.

Class 2. Lower arch distal to normal in its relation to upper arch.

Division 1. Bilaterally distal, protruding upper incisors. Usually mouth-breathers.  
 Subdivision. Unilaterally distal, protruding upper incisors. Usually mouth-breathers.

Division 2. Bilaterally distal, retruding upper incisors. Normal breathers.

Subdivision. Unilaterally distal, retruding upper incisors. Normal breathers.

Class 3. Lower arch mesial to normal in its relations to upper arch.

Division. Bilaterally mesial.

Subdivision. Unilaterally mesial.

*Orthodontia—New Combination of Well-Known Appliance—Forms of Appliances, Dental Cosmos, 836, 1899, p. 836.* We here find for the first time the use of the *Friction Sleeve Nut*.



Fig. 26.—Angle appliance in 1899.

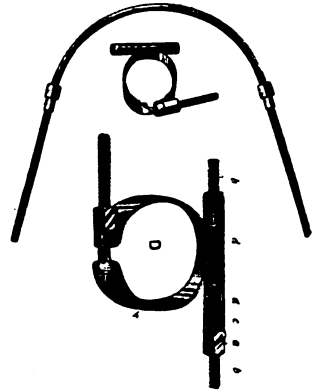


Fig. 27.—“D” bands and expansion arch, with friction sleeve nut.

“The expansion arch possesses qualities which will probably always keep it easily in the lead of all other regulating appliances. By its use we have control over the entire dental arch; over the teeth individually as well as collectively in contradistinction to the vast number of appliances which have been devised to act locally, principally by reciprocal force upon the malposed teeth alone, and by which so acting usually effect displacement of others originally in correct position, so that these in turn require additional devices for their correction, etc.

“Again, with the arch we have the greatest control over anchorage, being able to employ simple, reinforced, reciprocal, and even a certain amount of stationary anchorage, so that it is possible to concentrate upon one tooth the combined resistance of all the remaining teeth.

“Finally, it is an ideal pattern to guide in tooth-movement, and to which the dental arch is molded to conform, besides being a temporary retainer as well.

“In the improved form, as here shown, Fig. 26, it is believed that its size, proportion, strength, and elasticity, as well as stability of anchorage and attachments, are probably very nearly perfect. Fig. 27 is part of Fig. 26.



"Without doubt the greatest improvement which it has received in recent years is the substitution of annealed brass wire ligatures, Nos. 26 and 28, for the long-used fibrous or elastic ligatures, which were uncleanly, admitted of slipping and stretching, and exerted only a moderate amount of pressure. With a proper quality of wire ligature there is no slipping or stretching, and power being direct and positive and the maximum amount of force easily exerted. Most valuable of all, these ligatures may be tightened without renewal by an

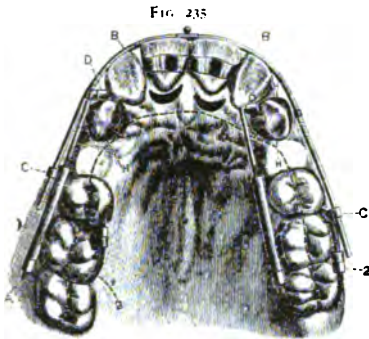


Fig. 28.—Traction screw used in combination with the expansion arch.



Fig. 29.—Appliance used in 1889, as in Fig. 16.

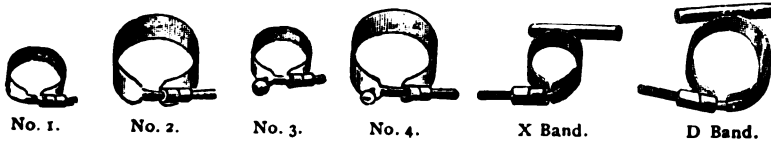


Fig. 31.—Various "D" and "X" bands.

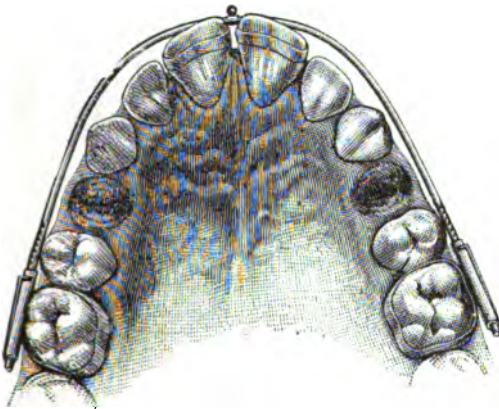


Fig. 30.—Appliance (Fig. 20.) applied to the teeth.

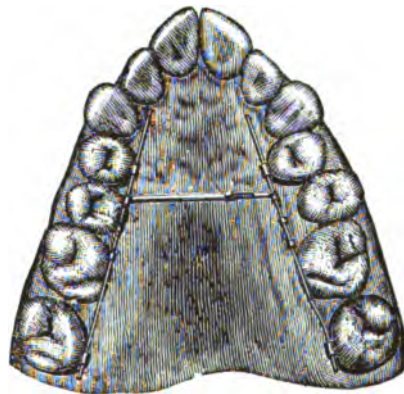


Fig. 32.—Appliances found in the third edition of Doctor Angle's book.

additional twist of their united ends, thus really adding to the ligature that ideal power, the screw. So the range of application and usefulness of the arch has been greatly extended, and, as well, the time of treatment with its use has been reduced fully one-half.

"The latest improvement of the arch is the extension flange or friction sleeve upon the nut, which fits with great accuracy into the sheath upon the clamp band

D and effectually prevents the annoyance of the nut becoming loosened by the friction of tongue or cheek. At the same time longer thread and consequent greater strength is gained without increase of bulk.

"In the intelligent use of the arch the teeth may be moved *en masse*; either arch may be widened by moving outward one or both of its lateral halves, or either may be lengthened or enlarged in any portion in front or on one or both sides thereof. Elevation, depression, or rotation, labial, lingual, or mesial movements of individual teeth may be accomplished with certainty and under the best control.

"But for the purpose of shortening the dental arch on one or both sides after extraction of a tooth, or the front by the moving inward of protruding



Fig. 33.—Appliances found in the third edition of Doctor Angle's book.

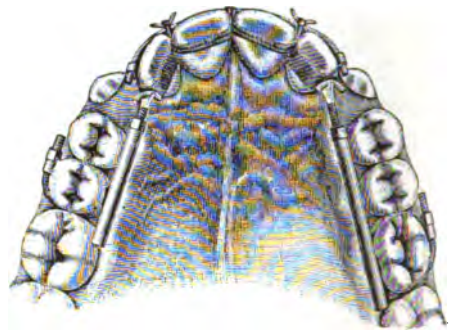


Fig. 34.—Appliances found in the third edition of Doctor Angle's book.

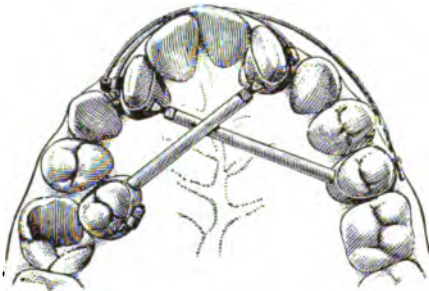


Fig. 35.—Appliances found in the third edition of Doctor Angle's book.

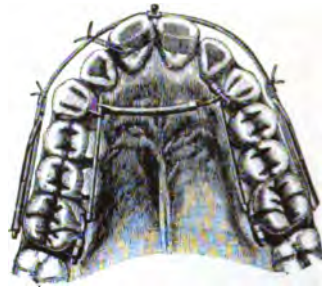


Fig. 36.—Appliances found in the third edition of Doctor Angle's book.

teeth, or for the distal movement of individual teeth, the expansion arch by itself is unsuited and should never be employed; not that it lacks in power, for this is ample, but for the reason that displacement of the anchor teeth will follow, their resistance being insufficient to overcome that of the moving teeth. It is the common experience of all that the combined resistance of the molars in simple anchorage is not equal to that of the cuspid alone. The molars are invariably tipped forward and the normal harmony of the occlusal planes, so necessary to maintain is destroyed. A careful study of the alveolus and of the length of the roots and attachments of the teeth confirms common observation and practice on this point.

"The difficulty of this movement, so frequently necessary, is successfully overcome by a combination of the expansion arch with the author's well-known device, the traction screw *A* and *D*, Fig. 28.

"The traction screw is adjusted for retraction of the cuspid first. The angle of the screw is made to engage a pipe soldered to a band encircling the cuspid, while the shaft of the screw passes backward through its sheath, which has been rigidly soldered to a screw-clamp band (No. 2) firmly clamped in cement upon the first molar. The retraction of the cuspid following tightening of the nut at the posterior end of the long sheath is easily effected, while tipping forward of the crown of the anchor tooth is impossible. It must be dragged bodily through the alveolus, if moved at all, (This form of anchorage is most efficient and valuable, and is best known as stationary anchorage. It was first suggested by Dr. Barrett.)

"By combining the expansion arch with this appliance the movement of other teeth is easily carried on at the same time. The end of the arch is securely supported by being passed through a short tube previously soldered to the anterior end of the long sheath of the traction screw. Of course the same combination may be used on both sides if desirable. If not, the opposite end of the expansion arch is secured in the usual way in the sheath of the clamp-band *D*.

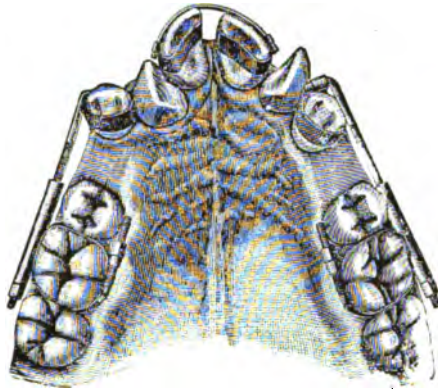


Fig. 37.

The expansion arch is attached to the teeth to be moved by means of spurred bands and ligatures in the usual way.

"It will be seen by studying this combination that we have reciprocal anchorage combined with stationary; in other words, the resistance of the force of the moving incisors is reacted to the molars, and helps to overcome the resistance of the retracting cuspid.

"This is a most valuable combination, and with it the most perfect control of that very obstinate tooth, the cuspid, is gained.

"A similar combination is extremely valuable in shortening the arch by retracting cuspids and protruding incisors after extraction of the first bicuspid, the force for retracting the incisors being received from some form of headgear upon the center of a plain threadless arch (arch *B*), the ends of which rest in tubes soldered to the ends of the long sheaths, as shown in Fig. 29, thus combining occipital and stationary anchorage. With its use we may shorten the time of treatment of these cases nearly one-half, and that, too, without displacement of the molar teeth, so important to avoid in all these cases."

(To be continued.)



# DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

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## GENERAL ANESTHESIA IN DENTAL SURGERY—WITH SPECIAL REFERENCE TO CHLORIDE OF ETHYL\*

BY G. W. BAMPFYLDE DANIELL, M.R.C.S., L.R.C.P. (LOND.)

*Formerly Anesthetist to the Dental Hospital and College, Edinburgh, Scotland.*

MY apology for presenting to you a paper is twofold; firstly, that it is good for us all, from time to time to pass in review some of the various members, their mixtures and sequences, of that powerful and highly interesting group of drugs, widely diverse, as they are, both in their chemical and physical properties, yet in their therapeutic action classed by us as one, namely, general anesthetics. The omission of this occasional review might lead us into an undesirable form of conservatism, tempting us to let pass new drugs, or better methods of giving older ones, or even some of the older ones, being out of our mental vision, might be forgotten; and, secondly, the reader, after having administered chloride of ethyl alone, and in conjunction with nitrous oxide, or ether, some thousands of times, and that largely for the needs of the dental surgeon, hopes to see from the experience necessarily gained if anything can be gleaned that may be of use or of interest to members of the dental profession.

In the study of the history and literature in connection with general anesthesia, one can not help being struck by the fact that many of the great advances which have been made in the art of the administration of these drugs bear a close relation with their use in dental surgery. Moreover, was it not a dental surgeon, Horace Wells, who first used nitrous oxide with success for the extraction of a tooth, in the year 1844? It was Morton, a dental surgeon, and a pupil of Wells, who first used ether with success for dental extraction in 1846. It was also in connection with dental surgery that the administration of nitrous oxide and oxygen, in mixture, was perfected, enabling the anesthetist to recognize the anes-

\*Read before the Dental Society of the Cape Province of South Africa, 1919.

thetic properties of the former as distinguished from those of asphyxia. It has led to the employment of this mixture for major surgical operations, improved in method, I think, by the employment of  $\text{CO}_2$  in the form of re-breathing, but I doubt if it will hold its present popularity for long in continuous anesthesia for the requirements of modern surgery without the help of a small proportion of ether—at least, that is my opinion from a practical point of view—as the anesthesia is not deep or regular enough, but I am satisfied with this present mixture, viz.,  $\text{NO}_2$  with oxygen,  $\text{CO}_2$  and ether, having administered it a number of times.

There is little doubt that the necessities of your branch of the medical profession have taught us the use of that valuable sequence nitrous oxide gas and ether.

When we consider these facts, it will not surprise us to find that for some time past the chief activities in relation to the anesthetic properties of chloride of ethyl have been centered to a large degree in the immediate neighborhood of the dental chair.

When working in London, and later, in Edinburgh, in my specialty, there was ample opportunity of making a study of this drug, and also of seeing the work of others. As a result, I published an article in the *South African Medical Record* of December, 1904, and of January, 1905. I have reason to think that this was the most complete of its kind at the time. Since then the literature on the subject has vastly increased, to an extent, indeed, that has rendered it to not a few of us rather confusing.

The action of this drug was being thoroughly investigated, and there were several well-attended meetings of the Society of Anesthetists in London, at which I was present, when the subject of ethyl chloride was carefully gone into. I am speaking of the years 1901-2. It was then administered by spraying a full dose on to lint or cotton-wool inside a mask, or by breaking a capsule containing either 3 c.c. or 5 c.c., neither of which method appealed to me, and I think I was the first anesthetist to recommend and practice the more gradual administration, at least I had not heard of this method before. With the ideas of this method in view I devised an inhaler which, on account of its simplicity, the method of administration, and its adaptability to the employment of nitrous oxide or ether in conjunction with the ethyl chloride, is as largely used today as it was years ago.

I also had made certain slight alterations in Hewitt's wide-bore ether inhaler, so that ethyl chloride, with or without nitrous oxide, can be given by means of the small bag of the apparatus, and without any other attachment to the inhaler as fitted for ether except the small measure glass. On going through some of my original articles, in the light of more mature experience, I am surprised to find how little my opinions and advice have changed, how little my methods of administration have been modified. I am using the same inhaler—in fact, the original one. My results are perhaps a little better as the outcome of many years' experience.

Up to today I have had no trouble with ethyl chloride, either alone or its mixture or sequence with ether, neither with its use in conjunction with nitrous oxide. I have never used ethyl chloride in relation with chloroform, nor do I ever

intend to do so, as I think such a procedure would not be unattended by risk to my patient.

Neither do I like it mixed with ethyl bromide.

I must have been one of the first to give ethyl chloride continuously for surgical requirements. It was administered for forty minutes. As a result, I expect I was also one of the first to give it up.

The anesthesia was not good, neither was the condition of the patient. An uneven anesthesia, frequently of too light a type, and a general depressed condition of the patient, marked a performance I was glad to see ended.

As an outcome of this war there has been a shortage of our old favorite anesthetic nitrous oxide, so much so that I had to exercise great economy with my scanty supply, reserving it only for such special cases in which it was thought no other anesthetic was advisable. Since the beginning of the war I have only given nitrous oxide and oxygen for dentistry a few times, and continuously for a surgical operation once.

I have used ethyl chloride alone or in mixture for most short operations, both dental and surgical, and the results up to now have been uniformly satisfactory.

I crave your pardon for speaking so much of my personal experience.

We all know that the anesthetic properties of chloride of ethyl were recognized long ago. According to Kappeler, the anesthetic properties were recognized by Flourens and others, and in the year 1848 Heyfelder successfully used it as a general anesthetic in the human subject. Clover used it in 1851, and the late Sir Benjamin Richardson in 1867. We may conclude that their results were not to their satisfaction. The reasons I do not know, but we do know that at that time there was a difficulty in procuring a pure drug, and it was not until recent years that it has been taken up again by anesthetists, and later by the general body of the profession. Here I would remark that I think that, unfortunately, the enthusiasm was out of all proportion to the advantages the drug offered. But for all that, we have in ethyl chloride a valuable adjunct to our list of anesthetic agents. I say *adjunct*, for I think that in the near future its place will be found more in conjunction with nitrous oxide or ether than alone, excepting in the cases I shall shortly mention. The reason for this we will refer to later. Its chemical and physical properties are now too well known to require mention, and it is needless to remark that the employment of the purest quality obtainable is absolutely essential. A reliable, but rough, test is that of its smell if allowed to evaporate on the hand; no unpleasant smell should be detected. Hydrochloric acid is a likely impurity, easily discovered by blue litmus which should be in contact with it for at least 15 minutes. Two points of practical interest: one is that the vapor is inflammable, the other is that it has a softening effect on black rubber, but under ordinary conditions none on red rubber. Our time will not permit of many details of interest, so with your kind permission we will now pass on to subjects of practical importance to you. The first question you have to put to yourselves is the safety of this drug as compared with other anesthetics, and I think the second will be its relative available anesthesia for one inhalation after the mask has been withdrawn. In making reply to the first question, I would preface my remarks by stating that chloride of ethyl has only recently been relieved of its anesthetic apprenticeship. One ad-

ministrator has recorded thousands of administrations without one single instance to cause him alarm, and that has fortunately up to now been my experience.

A friend of mine, for instance—and at one time we worked much together—has given about 15,000 administrations alone or with ether, and with no fatality, but, be it remembered, he is an old hand at “gas,” which is an excellent training for the drug under review. As time went on a few fatalities occurred, and then, a little later, rather an alarming number. My former partner, Dr. T. D. Luke, collected evidence of 22 fatalities, but details of only 17 of these are available (*Lancet*, May 5th, 1906).

We must, however, remember that this drug has been taken up by the general body of the profession in a way that no other anesthetic has ever been. A practitioner would record in glowing terms his experience of, let us say, fifty or a couple of hundred cases, as if that was any help to us. On the contrary, such reports may have done actual harm, stimulating the inexperienced—especially those who were brought up only to give chloroform—to try this rapidly anesthetizing drug in a way which the reader would almost call reckless. In reply to a question in the *British Medical Journal* of August, 1903, I took the opportunity of sounding a warning note, an extract from which I give: “As with the administration of other anesthetics, so with chloride of ethyl, caution and experience are required in its administration to produce good results in regard to a satisfactory anesthesia, a minimum of after-effects, with safety to the patient. I would strongly recommend intending administrators to see it given by an experienced anesthetist first, and to administer it under his guidance several times, and to several types of patients, before attempting to give it to his own patients. This will be an advantage to all concerned and the drug may not have to bear the blame which really may be due to faulty administration.”

Ethyl chloride is rather difficult to administer because the symptoms of anesthesia come on with such rapidity, and there are no well-marked “leave-off” signs as is the case with nitrous oxide. Also, for another reason, not always so well known or recognized by administrators, namely, that the anesthesia often deepens after early signs of anesthesia have begun, so that in certain cases it is advisable to remove the mask before deep anesthesia is established, otherwise we may produce a profounder anesthesia than is desirable. When to remove the mask is purely a matter of experience. The deepening is especially noted in patients with faulty lung ventilation, and is due to continuous absorption of the vapor from the lower air passages. I first noticed it in patients suffering from chronic phthisis. In these cases more air than usual should be given. Without any special reason to the contrary, I prefer to administer the drug to patients for dental extraction in the sitting position. There is better lung expansion in this position, and there is less danger of blood or a fragment of tooth entering the larynx. We must remember that the larynx and upper air passages share with the rest of the body the prolonged analgesia, so that there is a delay of the coughing reflex. This is also not so generally recognized as it should be. There is little doubt that ethyl chloride is by no means so dangerous as chloroform in dental operations.

Ethyl chloride may prove fatal in two ways: (1) by overdose, and (2) by

intercurrent respiratory embarrassment, causing asphyxia, which may lead to cardiac arrest. It is impossible to say in what proportion of cases dangerous symptoms occur, as so much depends upon the experience of the anesthetist, the selection of appropriate cases, and numerous other circumstances. It is impossible at the present state of our knowledge to attach even an approximate death-rate to this anesthetic, but seeing how indiscriminately it has been given by the inexperienced it can not be high.

In looking through fatalities we are struck by the number of cases quite unsuitable for this drug. As instance, a child suffering from diphtheria; alcoholic and cardiac diseases; hernia operation (vomited and died of asphyxia); advanced dropsy and swelling in neck. Some of these have been fully reported, and about eight out of the 22 were dental cases. Of course, for safety, there is nothing to compare with nitrous oxide, alone, with air, or oxygen, but unfortunately the available anesthesia is so brief that it is not suitable for operations requiring any length of time, without we accept continuous nitrous oxide given by the nose. I would like, now, in a few words to enumerate some of the advantages of chloride of ethyl.

It is not unpleasant to inhale if properly given, and by means of a suitable inhaler.

The loss of consciousness is extremely rapid.

The very young, the aged, and those suffering from anemia take it extremely well, also alcoholics and heavy smokers, i.e., cases not suitable for gas.

The cost of the fluid is not high, and the apparatus is simple and portable.

It leaves little or no smell in the room.

The patient can generally leave the operating room within a few minutes after recovery, comparing favorably in this respect with ether.

There is an absence of cyanosis, so alarming to the patient's friends, who will occasionally intrude themselves into the extracting-room.

Seldom stertorous breathing; no jactitations of the limbs or body. But that which appeals to us most of all is the long available anesthesia and analgesia as compared with nitrous oxide, and on this subject I would like to dwell more fully.

In the *Lancet* of October 21st, 1906, I published a series of 400 carefully timed anesthetics, performed by myself in the dental department of the Edinburgh Royal Infirmary. The time and notes were taken by Dr. William Guy, Dean of the Dental School, and Dr. Gibbs, one of the Dental Surgeons to the department of the the Royal Infirmary. Both gentlemen happen to be skilled anesthetists, as far as dental work is concerned, if not in general work. I knew nothing of the results until the work was completed, as the papers were kept by Dr. Guy, who handed me a copy some time after. I confined myself entirely to the administrations. I gave a hundred each of chloride of ethyl, and of chloride of ethyl and gas, and the same with "somnoform." The following is a summary of the ethyl chloride:—Sex—females 80, males 19, 1 not recorded; oldest patient 52 years, youngest 8 years.

Average period of induction, 46 seconds and a fraction; longest, 105 seconds; shortest 30 seconds.

Average available time of anesthesia, 75 seconds. The longest, 205 seconds; the shortest, 20 seconds.

The amount of ethyl chloride administered—the largest dose 6 c.c.; the smallest, 2 c.c.; the average dose 3 c.c. and a fraction.

The maximum number of teeth extracted, 25, with 6 c.c. of ethyl chloride, and an anesthesia of 205 secs. = 3 mins. 25 secs. The average number, 7.24.

As to symptoms: Phonation was noticed in 13 per cent. The pupil was normal in 13; 4 mm. in 43, 3 mm. in 24, 5 mm. in 15, and 2 mm. in 4. One not recorded.

Cyanosis occurred in 3 per cent; stertor in 19; involuntary micturition, 4 (all females), one child, the others adults; vomiting 5 (on recovery), all females; hysteria on recovery, 1; struggling and excitement on going under, 3; on recovery, 4; slight movement on recovery, but complete analgesia, 4; movements while deeply under, 1.

The pathological and other conditions recorded in this series are as follows: epileptic with enlarged tonsils; specific cirrhosis of liver; anemia and faint before (color improved and felt better after operation), lips blue and cold extremities before, i.e. shock from fear; alveolar abscess; tuberculous knee; anemia, 4; cardiac disease; syphilis. The inhaler used all through was the one designed by myself, a full description of which and my method for administration first appeared in the *British Medical Journal* of April 23rd, 1904.

The patients were unselected, unprepared, and taken in the order as handed in by the nurse in charge of the waiting-room.

How does chloride of ethyl compare with nitrous oxide and nitrous oxide mixed with oxygen? The short period of induction of ethyl chloride alone, and the strikingly prolonged period of available anesthesia as compared with the nitrous oxide group are very obvious. My friend Dr. McCardie's results are confirmatory evidence, he being a well-known authority; in fact, it is largely through his writings that the introduction of this drug has today taken the place it holds in general anesthesia. Our results are slightly different—only a few seconds—due, I think, to my using a smaller bag and perhaps giving the vapor rather more slowly by means of a graduated glass tube. There is also comparative economy in the amount used. Nitrous oxide and oxygen give the best results in the nitrous oxide group, but it takes an average of 110.5 seconds for an induction, and we know that a considerable quantity of nitrous oxide is used to produce an average anesthesia of 44 seconds.

We must not lose count of the greater safety of nitrous oxide alone or in mixture with oxygen, in comparison with ethyl chloride alone. In giving ethyl chloride alone, with gas, or in mixture or sequence with ether, it is extremely desirable that the patient abstain from food for at least three hours before, and 12 hours before take the usual preliminary purge. It is not necessary to mention that all constricting articles of apparel be loosened, and a mouth-wash directed to be freely used previously. Mention was made just now that the patients were unprepared, but, seeing that the operations took place between the hours of twelve and two, all patients to be in attendance at twelve, it is presumed that the last meal was breakfast. This may partly account for the low percentage of vom-

iting, viz., 5 per cent. I find in private there is more vomiting, often due to faulty preparation and a mistaken idea that the body requires fortifying.

Doubtless the free-liver will vomit after anesthesia unless prepared a day or two beforehand. A second inhalation will generally produce vomiting. I think my former colleague, Dr. Luke, errs when he states that nausea and vomiting take place in 20 per cent; anyhow, this is very far from my experience, 10 per cent being nearer the mark.

#### CHLORIDE OF ETHYL AND NITROUS OXIDE IN MIXTURE

Dr. Hewitt was the first to give this mixture, which he demonstrated at the Brighton meeting of the British Dental Association. He uses his own nitrous oxide apparatus, and introduces the chloride of ethyl through an opening in the bottom of the bag, employing a thick glass tube, into which he first measures the ethyl chloride. After the patient has inhaled the gas for a few seconds, he tips in the chloride of ethyl, the valves being of course thrown out, so that there is continuous re-breathing. His results are undoubtedly good—available anesthesia about 60—but I think rather better results are obtained by employing a one or two gallon bag and giving the vapor gradually. The writer of this paper has had his glass tube accurately marked in c.c., one to five graduations, and has had the base of the tube made flat, so that it will stand. These little details seem to have been universally adopted. The advantages of this mixture are well worthy of consideration. A few patients object to the odor of ethyl chloride, even if given gradually. Nitrous oxide is therefore an excellent anesthetic to begin with, also with those who are very nervous, and have taken nitrous oxide before with satisfaction and confidence, but in whom a longer anesthesia than nitrous oxide can give is required. With this mixture, as with chloride of ethyl alone, there is a prolonged period of analgesia, and in alcoholic and neurotic subjects better results are generally obtained than with nitrous oxide alone. But there are exceptions to this, and after-effects, such as nausea, headache, giddiness, are more frequent than after gas alone, but less than after ethyl chloride given alone, and of course considerably less than after ether. As yet no fatality has been reported. My hundred cases, again condensed for this occasion, are rather complicated, for the idea was to find out as to at what period the ethyl chloride should be introduced, how much gas, how much chloride of ethyl, how long to give the mixture, etc., in order to secure the best results. The entire subject fully discussed would embrace the whole time occupied by this paper. As a result, I submit the best results are obtained by using a one-gallon bag almost filled with nitrous oxide, re-breathing from the first—no valves—for ten seconds, and the mixture for 50 seconds—60 in all. The longest period of available anesthesia, 120 seconds; the shortest 35; the largest dose 5 c.c., the smallest 1.5 c.c. There was cyanosis, slight or very slight, in 13. Stertor slight or very slight in 4. Involuntary micturition in 1. Prolonged recovery (phthisical patients), 2. Went under quietly, but violent, struggling on recovery, 2. Great excitement during administration, 1. Vomiting, 1. A breath of air given in 5 cases. Vertical nystagmus in 1 case. Excitement on recovery, but complete analgesia, 3. Marked stertor in 9. Phonation on going under, 11.

Pathological conditions under this series:—Exophthalmic goiter. Epi-

thelioma of neck. Anemia (slight). Large abscess in neck. Chronic Bright's disease, 2; and very anemic women 2.

Up to now there has been no recorded fatality. I consider this mixture exceedingly safe, and why? It may be because the vapor has not been administered in too concentrated a form, due to the bag of the inhaler having first been filled with gas, and the ethyl chloride having been inhaled gradually. But in all probability there is another and more important reason. The common result of a dose of 5 c.c. of ethyl chloride, especially if rapidly administered, is a fall in systolic pressure. The fall is ascribed to inhibition of the heart. This inhibition can be eliminated entirely by the previous inhalation of a few respirations of nitrous oxide gas, which is supposed to depress the vagus inhibitory center. When, say, five breaths of nitrous oxide are given prior to ethyl chloride, an asphyxial rise of blood pressure takes place. This can be prevented by the inhalation of a gallon of oxygen before the nitrous oxide. Thus the sequence oxygen-nitrous-oxide-ethyl chloride entails no asphyxia, no alteration of the blood pressure, and the period of available anesthesia remains the same as in the case of ethyl chloride given alone. I hold there is danger in a concentrated vapor, such as when given on lint or a sponge in a closed inhaler, or in a broken capsule, or projected through some hole in the inhaler directly from a cylinder. We know that a concentrated dose of chloroform will kill with astonishing rapidity, and the strength of chloroform vapor is being reduced less and less, with satisfactory results, and it is now understood that chloride of ethyl has something of the same physiological effects, so that it is not unreasonable to suggest, as I have years ago, that the drug should be given gradually. It can not be so lethal as chloroform, otherwise why should we be able to give it with nitrous oxide without air, and in such doses? The whole point of my argument is, give it gradually with air or with nitrous oxide gas; do not overpower the cardiac and respiratory centers with too concentrated a dose. Being highly volatile and readily absorbed, this is a source of danger.

#### ETHYL CHLORIDE AND ETHER, MIXED

Although, as mentioned before I have not as yet had any cases of respiratory or cardiac troubles with ethyl chloride given alone, yet, on the score of caution, I have for some years been in the habit of adding a small quantity of ether to the ethyl chloride in the small measure glass previously described. This especially in feeble subjects and when it is necessary to give a large dose of ethyl chloride. By this means we employ the stimulating properties of ether much in the same way as it is used in the C.E. or A.C.E. mixture. Although mixed, the evaporation of the two is unequal, and this is a distinct advantage. The chloride of ethyl vapor, predominating at first, produces rapid loss of consciousness, followed by anesthesia, and later, when the depressing action of the ethyl chloride may become manifest, the stimulating action of the ether will come into play, for it is towards the latter stage of anesthesia that there is the increased proportion of ether in the vapor, the intake of which is favored by the increasingly deep and more frequent respirations. I fully described this method in the *British Medical Journal* some years ago.

The anesthesia is very good, and the patient's condition is more in the direc-



tion of stimulation than otherwise. Of course this method admits of great variety of effects, according to the proportions of the two drugs used. If much ether be added, the induction is longer and the patient may complain of the smell of the ether. Nitrous oxide can first be given, and then the mixed ether and ethyl chloride, and thus administered patients do not complain of the smell of ether.

Another method of giving the mixture in order to produce a true mixed anesthesia is by the employment of an ordinary Clover's inhaler, with the measure glass attached to a large tap on the angle mount, or the wide bore ether inhaler, designed by Hewitt and modified by myself, for the purpose of being able to give in a simple way chloride of ethyl or nitrous oxide or oxygen. With this mixture we are enabled to get an available period of anesthesia varying from two to three minutes, and even longer.

About half an ounce of ether is put into the ether container, and about two and a half c.c. of ethyl chloride into the measure glass, which is attached to the tap. The latter is gradually introduced, and then, when signs of unconsciousness begin to be shown, the ether is turned on, and as quickly as possible.

#### THE ETHYL CHLORIDE-ETHER SEQUENCE

This is nothing more than a continuance of the anesthesia mentioned just now with ether alone, in the usual way. It has largely supplanted the gas and ether sequence because the patient is more rapidly plunged into forgetfulness; there is little or no cyanosis, less congestion of the throat and upper air passages, and therefore less secretion from the buccal mucous membrane—this latter of interest to those working in the mouth and throat. There is less secretion of saliva. The apparatus is more portable and convenient to manipulate. It is of course used when a longer time is required than the above-mentioned drugs or their mixture can give. The available anesthesia furnishes ample time for the operator to clear both upper and lower jaws of teeth and roots. As with ethyl chloride alone, or its mixtures with ether, the patient is prepared the same as for a surgical operation. I sometimes think that if convenient to all parties concerned, dental extraction of any magnitude should be performed in the patient's own house, or in a nursing home, as there is less risk of the patient contracting some pulmonary complication; also, these long dental operations entail often a considerable amount of shock, so that a delicate patient is better put to bed at once, and, further, there is less chance of vomiting if the patient be kept quiet for some time.

## THE LATE EFFECT OF THE HARELIP AND ITS CORRECTION BY A NEW OPERATION

By J. L. AYMARD, M.R.C.S., L.R.C.P.

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THE photographs of this young girl are representative of a series of similar successful cases, and present a condition familiar not only to surgeons but the general public—the tightly stretched upper lip giving the appearance of the underhung jaw, the absence of the red margin, and the loss of the proper contour in both dimensions, together with the absence of the philtrum. The nose in such cases is very frequently flattened and deflected, and nasal stenosis a necessary accompaniment. In young ladies, especially, the appearance is detrimental



Fig. 1.

Fig. 2.

Fig. 1.—A typical side view before operation, giving the appearance of an underhung lower jaw.

Fig. 2.—Side view after correction by operation.

to marriage, and as far as I know there are no cases on record in which the difficulty of correction has hitherto been overcome.

The nasal condition associated so frequently with these cases is extremely complicated, and many considerations must be taken in view before any attempt is made to correct the same. A study of the correct anatomy of these parts, published by me in the *Journal of Anatomy*, will assist considerably, but I would

lay it down as a law that the preliminary correction of the nasal trouble and the lip must be made at the same time. To correct the position of the nose it is frequently necessary to readjust the nasal crest, and the complete exposure of the floor of the nose is often essential. Although the operation as illustrated looks comparatively simple and some may be tempted to try it for the sake of kudos, I would warn such surgeons to make themselves familiar with all the necessary adjuncts to success, such as the correct amount of overcorrection, the freeing of all the tissues in the neighborhood and the supporting sutures, and many other details known to the plastic surgeon. It is obviously a temptation to perform any operation for the restoration of the lip, and then to send the case to the nasal

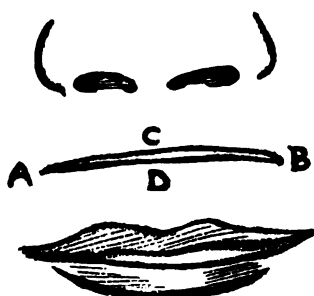


Fig. 3.

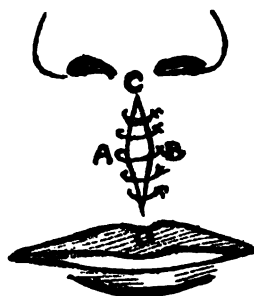


Fig. 4.

Fig. 3.—Shows the incision made from the inside through the whole thickness of the lip up to the inner surface of the skin.

Fig. 4.—Shows the incision sewed up in the opposite direction. The deep supporting sutures are not shown, nor the incisions for freeing the surrounding tissues.

surgeon to restore the nose, but the unfairness of such a procedure will be obvious when I explain that if the lip be repaired separately the subsequent operation to expose the floor of the nose would so stretch the lip that it would break down even after the lapse of a considerable period. In the near future I hope to publish a paper on the whole subject of harelip and cleft-palate, which I think may throw considerable light upon this hitherto somewhat unsatisfactory subject. The period preferable for such operations I would place from six to four years of age.

# **DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY**

Under the Editorial Supervision of

**JAMES DAVID MCCOY, D.D.S., Los Angeles—ROBERT H. IVY, M.D., D.D.S., Milwaukee  
B. FRANK GRAY, D.D.S., San Francisco—C. O. SIMPSON, M.D., D.D.S., St. Louis.**

It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

## **RADIODONTIC EXAMINATION WITH SPECIAL REFERENCE TO LOCALIZATION OF UNERUPTED TEETH\***

BY CLARENCE O. SIMPSON, M.D., D.D.S., ST. LOUIS

**T**HE evolution of modern orthodontics from the pioneer operations, the scientific study which has been applied to this development, and the wonderful transformations produced by orthodontic treatment, is a source of inspiration and pride to observing members of the dental profession. Orthodontists deserve the credit of contributing to the profession their observations on the basic principles of occlusion, and the far-reaching effects of malocclusion which have markedly broadened the conception and improved the technic in most branches of dental practice. No more striking exemplification of the favorable results of concentration in a limited field of endeavor is evident than in the practice of orthodontia.

It is unnecessary to offer a plea before this society for the advantages of specialization since all of you have chosen this course. Your personal experience has strengthened your convictions, and your accomplishments are abundant proof of the efficiency of limited practice. As practitioners of one of the first established specialties of dentistry you are asked to consider what claim radiodontia, one of the recent specialties, has for recognition, and of what service it may be to you. While a few orthodontists have done notable work in radiodontia, most of you have been in the same position as the general practitioner of dentistry in this matter. Until recently the dentist, orthodontist, and exodontist have referred radiodontic examinations to a general radiographer of medical or laboratory training, who attempted to dignify or mystify his vocation by publicly proclaiming himself a disciple of Professor Roentgen, but attached little importance to dental radiography. The other alternative was being exploited by the energetic optimistic salesman into installing radiographic equipment, and endeavoring to become proficient in the operation of it, or worse, delegating the work to a

\*Delivered before the Nineteenth Annual Meeting of the American Society of Orthodontists, St. Louis, Mo., March 10, 1919.

lady assistant. Rarely has either of these methods proved satisfactory, or given the dentist or orthodontist the adequate service.

The general radiographer is handicapped by a lack of familiarity with dental operations, and has such a volume of diagnostic and therapeutic work that dental examinations can not be given the deserved attention. The dentist being inexperienced in radiographic diagnosis has not insisted upon better service as have the physician and surgeon, and service is seldom more efficient than the demands

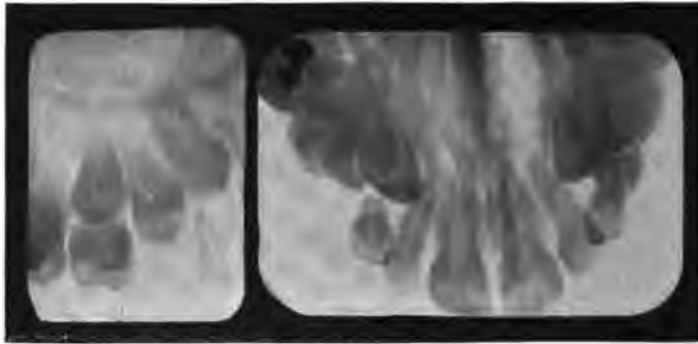


Fig. 1.—The usual method in attempts to determine the location and position of unerupted teeth. The small film is a lingual view through the bicusps, and the larger film was retained between the teeth while the rays were directed downward and backward through the base of the nose; the latter producing only a lingual view with inferior detail of the incisors, and a vague conception of the bucco-lingual position of the bicusps.



Fig. 2—A true occlusal view of the same arch in which the bucco-lingual and mesio-distal relationship of the teeth are shown. This in connection with the lingual views to determine the distance of erupting teeth from the occlusal plane supply data for localization.

made upon it. If the dentist succumbs to the propaganda of the manufacturer and installs radiographic equipment, he will be obligated to an investment and maintenance expense for which he probably will not be directly compensated in fees, and he will be compelled either to utilize an additional room or convert his operating room into an equipment display. Unless he will devote equal time and study given to any exacting technic, his results will be inferior, and if he attempts to train an assistant for the entire operating he is likely to complicate the situation and cloud the diagnosis.



Fig. 3.—A partially developed malposed bicuspid, through which the lingual view parallels the long axis, leaving the observer at loss as to whether the crown is presented buccally or lingually.



Fig. 5.—A supernumerary, the development of which resulted in traumatic devitalization of the left central. Although it appears to be wedged between the centrals, there is uncertainty as to the form and exact location.



Fig. 4.—This occlusal view discloses the position, and the bucco-lingual location which could not be determined from the lingual view.



Fig. 6.—This aspect facilitates surgical procedure by showing it to be rudimentary in development and lying to the lingual of the central incisors.

The choice of ways and means is a matter of individual opinion, but the radiographic results of different methods are not influenced by personal prejudice, they are vivid records always subject to comparison. Discrimination of radiographic films and plates is developed by critical study of them; the average standard is far below existing possibilities, and nothing short of the maximum information obtainable should be tolerated. Dental and oral radiography has been a neglected and undeveloped field, and the orthodontist has not received the proper cooperation in radiodontic examinations, nor sufficiently utilized this indispensable adjunct to orthodontic treatment. In view of the development of any art or science from specialization or intensive application, it is a logical con-

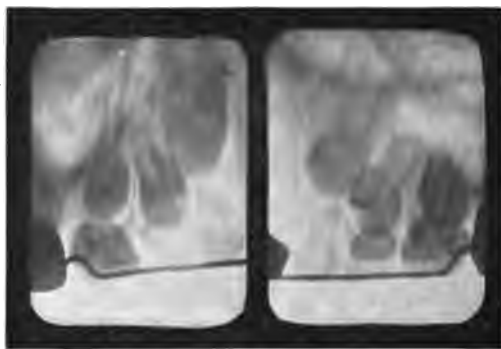


Fig. 7.—Lingual view of secondary dentition which does not establish the bucco-lingual relationship of the teeth.



Fig. 8.—Occlusal view which completes the localization of unerupted teeth in Fig. 7.

clusion that the limited practice of radiodontia will produce decided progress in dental radiography.

Some orthodontists believe that they can photograph their patients to best show improvements in facial contour from the correction of malocclusion, but excepting stereophotography, it seems more of a conceit than a necessity. It is possible that the professional photographer would not obtain the striking "before and after taking" effect including coiffure, sartorial embellishment, and ex-

pression, sometimes observed in photographs of these cases, but with proper instruction he should supply uniformly accurate records. The orthodontist with sufficient practice to occupy his time who assumes radiodontia is likely to appear in the same aspect, and secure results similar to the busy dentist who attempts orthodontia. If to orthodontics, art, engineering, and prophylaxis, is added photography and radiography, we may tax our versatility and become a "one-man organization," rivaling the activities of the drummer in a "jazz" band. During the early development of dental specialties necessity may have compelled lax restrictions in limited practice, but in the future combinations of orthodontia,

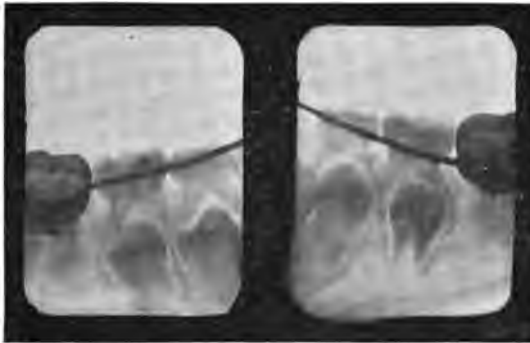


Fig. 9.—Lower bicuspid regions of same case as Figs. 7 and 8.



Fig. 10—Occlusal view of entire lower arch, which establishes the relative location of the erupting teeth in Fig. 9.

exodontia, periodontia, or radiodontia, may arouse suspicions of commercialism and a questioning of altruistic motives.

The fundamental requirements of radiodontic examination for the orthodontist are: determining the absorption of deciduous teeth, and the presence, location, position, mesio-distal diameter of crowns, and degree of development of the permanent teeth. This does not constitute a formidable number of requirements, but in view of the limitations in radiographic technic, and the difficulty of securing immobility and cooperation from young patients, it demands



qualifications which combine speed, legerdemain, and hypnotism. During secondary dentition every child should have a radiodontic examination at least once each year to determine the indications for exodontic or orthodontic treatment. The orthodontist who ignores the opportunity of supplementing clinical observation and physical examination with routine radiodontic records may be classed with the dentist who makes every diagnosis by subjective symptoms and swelling.



Fig. 11—An excessive application of intermaxillary force in a Class III malocclusion which has resulted in a distal inclination of the first molars.



Fig. 12.—Occlusal survey of the case in Fig. 11.

Decalcification of deciduous teeth may not progress normally, and radiodontic examinations will indicate the removal of deciduous teeth which are retaining or deflecting the successors. Caries or pulp involvement often suggest the removal of deciduous teeth which radiodontic examination shows should be retained for maintenance of space to accommodate the arrested development or delayed eruption of the permanent teeth. With a difference of opinion which is characteristic of authorities upon any subject, tables for the period of eruption not only present a latitude of two or more years, but vary quite materially. A discrepancy of two or three years between anticipation and manifestation is sufficient to wreck the occlusion. Prophylaxis, the ultimate in operative dentistry, is also applicable to orthodontia.

The presence or absence of permanent teeth sometimes becomes of critical importance to the orthodontist who has applied treatment with a sublime faith in nature "running true to form" and supplying the normal quota of teeth. The congenital absence of teeth is not sufficiently rare that it may be disregarded and the early knowledge of it, secured through routine radiodontic examinations, would modify treatment and avoid chagrin and humiliating explanation. Lamentably, too often radiographic examinations supply little exact information be-



Fig. 13.—A thorough inspection of the maxillæ which in connection with the history conclusively proves the congenital absence of a lateral incisor. To exclude the possibility of a migratory tooth by the elimination process of former methods requires several lingual views and extraoral plates.

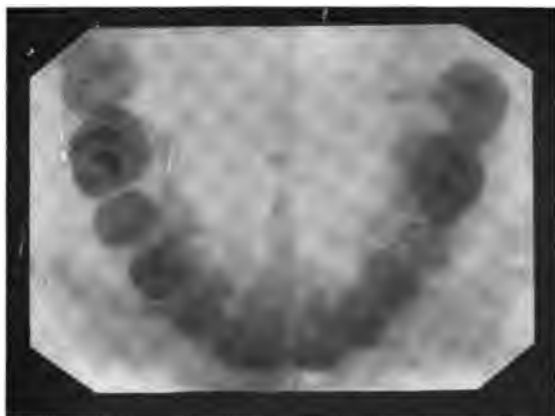


Fig. 14.—Congenital absence of two upper bicuspids

yond establishing the presence of teeth, which is inadequate for rational orthodontic procedure. The relative location and position of unerupted teeth must be determined to form a prognosis and choose methods to assist the teeth into normal occlusion. The interpretation of a plane, radiographic film, or plate, is misleading in direct proportion to the divergence of teeth from normal position. Textbooks which are often as amusingly antiquated as ladies' fashions of a for-

mer period, lamely advocate stereoradiography, for localization of malposed teeth. Stereographic intraoral films are difficult to produce under favorable conditions, which so rarely are presented by children. When obtained, they only add perspective, with its possibilities of illusion, and the disappointment in at-



Fig. 15.—Radiographic examination neglected while space was retained two years for a bicuspid which did not exist.



Fig. 16.—Two upper malposed unerupted third molars, which were suspected of being the source of reflex disturbance.

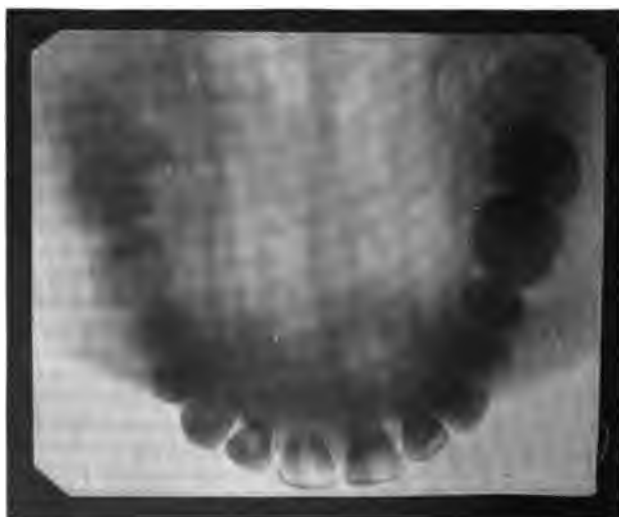


Fig. 17.—This occlusal view of the third molars in Fig. 16 establishes the location and position for the exodontist.

tempts to distinguish the relative position of small objects in comparative proximity. Precision in determining form, and location is attained by viewing object in two or more planes of the three dimensions. In the standard technic for intraoral films, the rays are directed from the buccal or labial at a variation of 45 degrees in a mesial or distal aspect and at a variation of 25 degrees toward the vertical or horizontal plane. This is often insufficient to ascertain the outline of malposed teeth and totally inadequate for localization.

The method herewith proposed is the extension of the vertical—horizontal

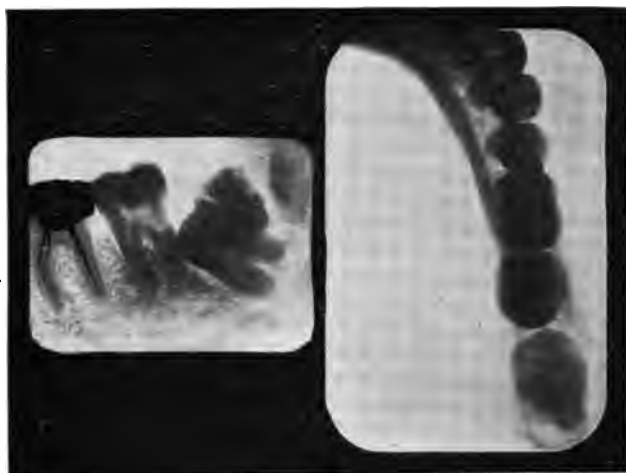


Fig. 18.—A clinical diagnosis of "bone tumor" was made, and an alleged operation performed seven years prior to this examination, which determines location of an odontoma from a lower third molar.



Fig. 19.—Illustrates the accuracy with which the size is recorded by a fine focus tube at a long film target distance. The calipers adjusted to the exact width of the tooth rest on the film, while the tooth is suspended one inch above.

arc from which the rays are directed, from 25 degrees to 90 degrees in either dental arch, permitting various views from both lingual and occlusal aspects. To a limited degree this method has been used for the mandible, but no mention has been observed of its use for the superior maxillae. The technic employed is the use of films slightly larger than the arch, placed on an aluminum base to maintain a flat surface and prevent distortion. The film pack is carried distally to the anterior border of the ramus and the teeth occluded on the metal and pack to retain it. For the lower arch the patient is posed with the head thrown backward to a horizontal position permitting the rays to be directed at right angles to the occlusal plane of the arch. For the teeth in any particular region a smaller

film is used and the rays directed parallel to the long axis of the teeth. For the upper arch, with the head in a vertical position, the rays are directed downward through the parietal bones, slightly anteriorly to a perpendicular of the film for the entire arch, or directed parallel to the long axis of any tooth. This produces an occlusal view which in connection with a lingual view determines the location, position, and the approximate form of the teeth, comprising highly important data for the orthodontist. Young patients are especially adaptable to this technic since it eliminates the digital retention of the film and the discomfort to the soft tissues in the floor of the mouth. An appeal to the competitive spirit by reference to a mythical little girl who accommodated a much larger film, will secure a startling buccal capacity, and the average child, from prehensile instinct, will bite even when instructed to the contrary. The same care must be exercised in making the examinations through the skull, as in sinus examinations, limiting the exposure to the minimum to obviate the danger of alopecia.

The opportunity to ascertain the size of the secondary teeth before eruption should be of great practical value to the orthodontist, and this may be accomplished with great accuracy by radiographic records. With a fine focus tube, a target film distance of 18 inches and the tooth one inch from the film, the image is not enlarged to any practical degree, about  $\frac{2}{10}$  of a millimeter. The mesiodistal diameter of each tooth may be determined by the occlusal view, and the permanent arch charted long before eruption of the teeth. This permits preliminary treatment to accommodate the secondary dentition, and is of special value in securing and maintaining space for the delayed eruption of one or more teeth.

These details are presented for the consideration and discussion of this body, to obtain an appraisal of the practical value of thorough radiodontic examinations for the orthodontist, and to stimulate suggestions for improvement in this phase of radiodontic practice. Cooperation between practitioners of specialties so intimately related as are those of dentistry, is mutually advantageous and a potent factor in the progress of dental science. Radiodontia is in a plastic state of its development and will conform to the demands and ideals of the dental profession; may it not have the inspiration of your confidence, constructive criticism, and guidance?

#### DISCUSSION

*Dr. R. J. Wenker, Milwaukee, Wis.*—In connection with this discussion of localization of impacted teeth, I would like to report a case of unusual interest.

In April, 1916, an exceedingly interesting case came into my hands in the person of a dentist about 40 years of age, who had an impacted upper third molar operated upon three successive times within a period of three days, and in which the tooth had become lost in the soft tissues at the first operation. The tooth was originally located in a perpendicular position, immediately distally of the second molar, and completely covered with soft tissues. The first step taken by the surgeon in charge of the case, was to secure a good x-ray. Local anesthesia was used and in the attempt to tip the tooth out of the socket by means of elevators, it became lost in the soft tissues posterior to and above its original position. This operation was performed at the surgeon's office, and immediately following the accident, the patient was transferred to the hospital, and in the afternoon of the same day under ether anesthesia a futile attempt was made to recover the tooth. After a lapse of one day, another x-ray was taken and the tooth was indicated at a point lingually and slightly anterior to the upper extremity of the coronoid process of the



Fig. 1.

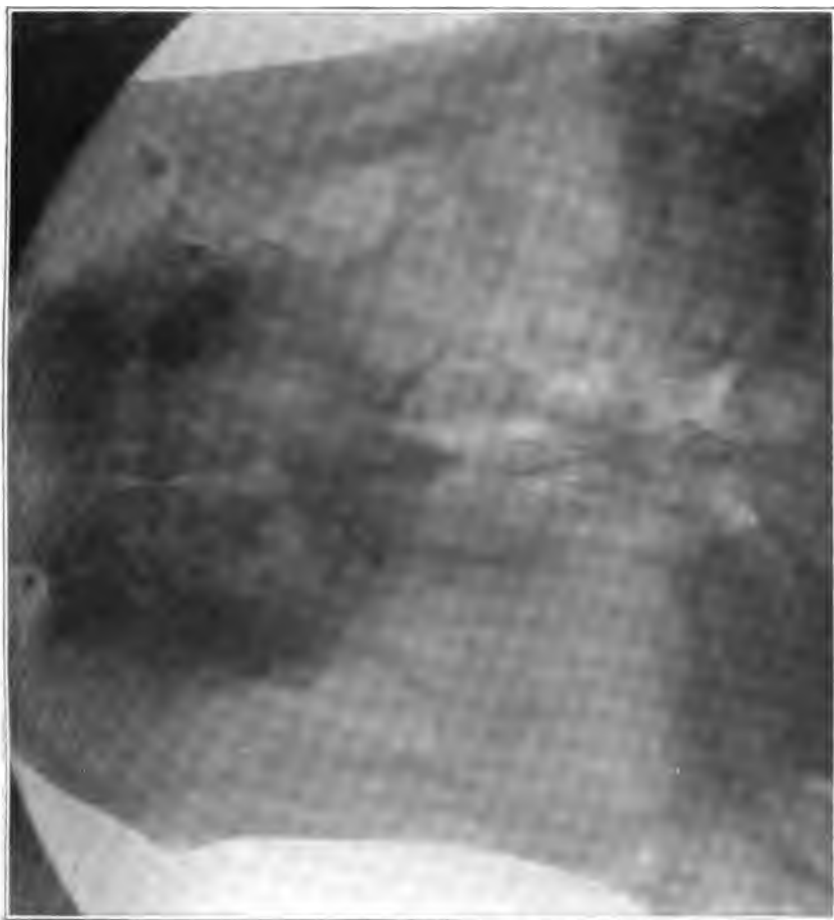


Fig. 2.

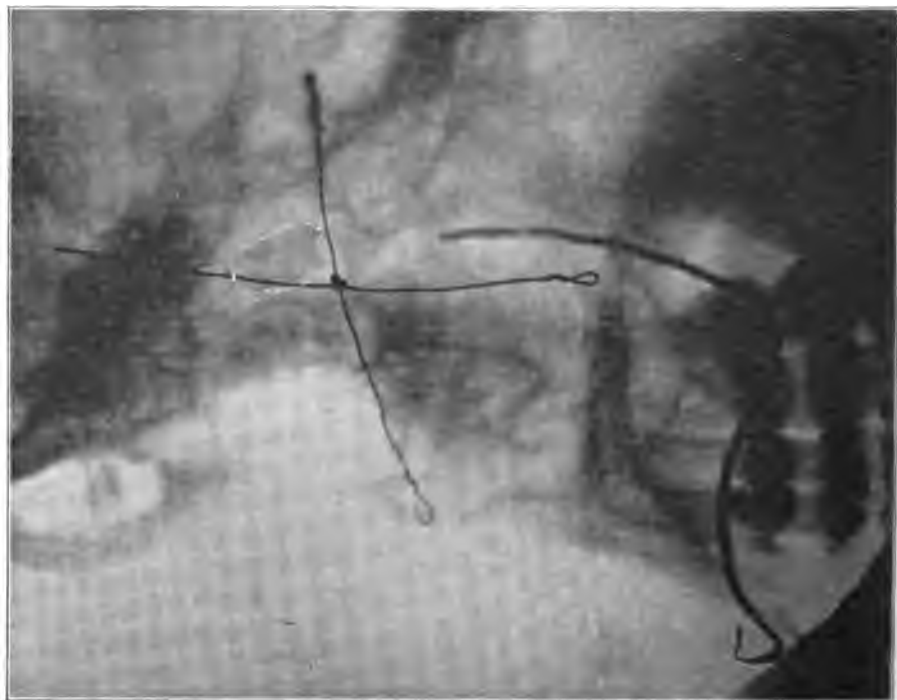


Fig. 4.

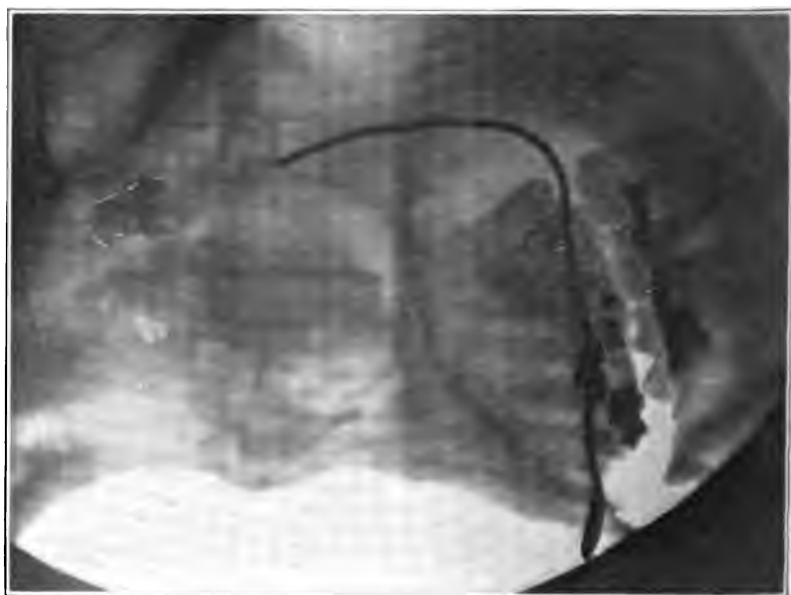


Fig. 3.

mandible. The same day another futile attempt, under ether anesthesia, was made to recover the tooth.

Three days after the last attempt, I was called in to take charge of the case. My first effort was made to combat the infection. The face and side of the head were extensively swollen, the pulse was rapid and very irregular, and the temperature was 102°.

The upper margin of the swelling was sharply outlined by an abrupt termination along the line of the bony attachment of the temporal muscle. This gave me the suggestion that the tooth was pushed beneath this muscle, which in my subsequent examination proved true.

The infection was combated by frequent irrigation of the wound back of the second molar and up as high as the irrigating tube could be extended without extreme pain.



Fig. 5.

This irrigation was the first the wound had received, although six days had elapsed since the first operation. Besides the irrigation very hot boric acid packs were applied continuously, day and night, except while sleeping, for two weeks. At this time the patient was in a satisfactory condition to take to my office, and take x-rays to locate the much sought for tooth. Fig. 1 is an illustration showing the original position of the tooth. Fig. 2 is an anterior-posterior view and is my first effort to locate the tooth. At this time it occurred to me that a silver wire inserted as high as possible into the wound, and ligated to the buccal surfaces of the bicuspid and molars would be some assistance in locating the tooth. Fig. 3 is a side view with wire inserted. Note that the tooth is mani-



fest in the lower and anterior portion of the temporal fossa, beneath the zygoma and about one inch posterior to the anterior border of the external orbital margin. The following day this view was repeated by reinserting the wire in the mouth wound, and using Fig. 3 as my guide, a cross was made of silver wires and located on the outside as nearly over the tooth as possible. This view is shown in Fig. 4. In Fig. 5 we have an anterior-posterior view with the same wires in place. In the two latter figures, the tooth was outlined with a lead pencil to bring it more clearly to view.

In the removal of the tooth, sixteen days after taking charge of the patient, ether anesthesia was used and a skin incision was made above the zygoma and just anterior to the hair line. By blunt dissection the temporal muscle was exposed and split. Then a search for an hour and a quarter was made for the tooth. After nearly despairing in my effort to find it, I recalled that the tooth shows a slightly different position in Figs. 4 and 5. This was probably due to movement of the temporal muscle over the incline formed by the external surface of the skull beneath the zygoma where the tooth was lying. The muscle movement caused the tooth to move to a more anterior position into a deeper part of the fossa. I therefore placed my index finger into the mouth wound, and strained and searched until I located the tooth with my finger tip, and while maintaining this digital contact the tooth was removed with a pair of hemostats through the external incision.

There must have been some leakage through the gum tissue, admitting infection to the impacted molar to explain the existence of caries in the crown of the tooth. This cavity on one side of the tooth and a hook on the end of the root on the other side, helped to hold the tooth in each new position as it was pushed up into that location. I might add that it is a very easy thing to lose a tooth in the manner and location that this one was lost. If you do not believe it, try it. I have tried it by making a free use of elevators on this type of impaction and came very near losing a number of them in the same way. Such a tooth can easily travel between the pterygoid muscles on one side, and the ramus of the jaw part of the way and the temporal muscle on the other side until it reaches that position. It did not pass through any muscle, but between muscles and other structures, and it is an easy place to get a tooth into. Only a slight amount of pressure is necessary to push it there.

*Dr. George B. Winter, St. Louis, Mo.*—I have enjoyed the reading of the paper of Dr. Simpson very much, and desire to compliment him on the able manner in which he has presented the subject. The diagnosis of impacted teeth is a very important matter. I was particularly interested in the slides of the case showing the occlusal plane of the tooth without any root formation.

It is not uncommon in a case of impaction of a lower third molar to have complete lingual displacement. When the x-ray operator, following a certain procedure as to position of both the tube and patient for impacted lower third molars, determines that the tooth is lingually displaced, another film should be inserted, and an odontograph made as when radiographing a superior third molar. In following this method, all of the root of the tooth is brought out in the picture, and the entire detail of the root formation is presented.

I have seen many cases of impacted teeth where the pressure was on the distal surface of the second molar to such an extent that there was no contact between the second and third molar. In addition, in such cases there is usually a destruction of the periodontal membrane on the distal surface of the third molar, and it is not uncommon to find an exposure of the tooth pulp on account of the pressure caused by the impacted third molar.

The accident in the case of a superior third molar as presented by Dr. Wenker is of common occurrence. It occurs when the lower third molar is impacted and the entire lingual plate has been destroyed, with a pathologic condition prevailing. Where any pressure is created buccally on the third molar and the lingual plate has been destroyed, the tooth is pressed lingually into the soft tissue. The same condition is presented with the upper third molar where there is an impaction pressing on the distal surface of the third molar.

When the elevator is applied between the second and third molar, there is a liability to push the tooth into the soft tissue. The liability of such an accident occurring may

however, be minimized by excising a part of the buccal osseous structure and straightening the tooth sufficiently with an elevator to allow a good adjustment of narrow-beak forceps, but care should be taken that the beaks do not strike the crown.

*Dr. E. G. Weeks, Saginaw, Michigan.*—A year ago Dr. Kells gave us a very beautiful paper. The doctor, as I told him personally, went into this too deeply. He used a tube stand, home made; it has stereoscopic adjustments and all movements necessary to produce beautiful radiograms, as you gentlemen know.

When Dr. Kells finished his paper, one of our members finished the evening in discussing terminology, and we knew, perhaps, after it was all over that telegraph, telephone, photograph and several other "grafs" came from some Greek "graphs," but we did not get a thing that Dr. Kells wanted to impart to us. Dr. Kells went at the localization of impacted teeth stereoscopically. I told him then he could locate them much more easily by taking two views of the same location from two different angles. Now, we all strive to improve on our work, and if we feel we are original in finding some way of getting better results in an easier way than the other fellow does, we should be willing to give to each other these ideas as soon as possible.

I did not know, when Dr. Kemple asked me to discuss this paper of Dr. Simpson's, just how the doctor went about to locate or localize the teeth, and I felt that he was going to give us something along Dr. Kells' idea, and I made up my mind to bring on a few slides to show why I thought my way the best. I wanted to "beat some one to it."

Dr. Simpson invited me out to his office last Saturday, and what do you know? Here I found my idea—at least I thought it my idea—as I had never seen it before, in use by Dr. Simpson. I saw many beautiful radiograms. Dr. Simpson is taking great pride in his work and deserves much credit.

I must say that I do not agree with the doctor when he says "we will become a one-man organization, rivaling the drummer of a jazz band," if we take our own radiograms and photographs; why doesn't he also add, taking impressions?

Now, why do we take impressions? I have heard one or two say, "oh, just for an impression on the parent." Well, I think those fellows too big and bright for our bunch; some of us are not so large. We must study our cases from every angle inside and out; we must get histories, not only of today, but of early conditions as far back as birth, and even before, in some cases. If this is so, we take impressions of all the structures we can get in the plaster. Years ago this was enough; today it isn't. We have seen the mistakes in the guesswork of our older men and we must profit thereby; missing supernumerary, impacted and malposed impacted teeth. We must know not only that these conditions exist, but their exact locations.

I have heard an efficiency man of some note make the statement that "an operator who does anything away from the chair that can be done by his assistant is as far behind the times as is the business man who writes his letters in long hand." I believe him. We take impressions of the mouth, give them to our assistant and she does the rest. Now, isn't it our duty to take the radiograms and photographs and let her finish them? It can all be accomplished in a very short time, and we can sit down at our study table, first study the teeth as they occlude, then, if any teeth are missing, we can reach over to the x-ray light box and see at a glance just what condition we will have to combat.

I believe that every case that presents itself for examination should be examined, not glanced at and shot at in the darkness of guesswork.

I have a few slides and will show them at this time.

*Dr. V. E. Barnes, Cleveland, Ohio.*—The slides that have been shown in connection with the localization of teeth are very interesting, and the localization of the cuspids is very good. I have recently devised a method for localizing molars which is so simple and logical that I have been amazed that none of us discovered it before.

This is a very good picture in the negative, and a fairly good one in the slide.

In taking these pictures to localize the upper and lower third molars, we should see as great an area as possible. We should take them showing the angle of the jaw, the character of the bone, as well as the position of the roots in relation to one another and to inferior dental canal. In our work it is not so necessary to know the length of the molar, but

it is essential to know whether the third molar has room to erupt back of the second molar.

This is the case of a child showing the normal eruption of third molars. In impaction cases in nervous people you will find the roots of the third molar resting apparently mesially or upon the inferior dental canal, with consequent pressure on the nerve. An abnormally small picture does not show the relation of the teeth roots to this nerve.

Here is a case of impaction where expansion was made in such a manner as to produce no posterior movement of the molars, yet we had impaction of third molars at 13 years. You might work until doomsday and not have the third molars satisfactory. This is a case for extraction of the second molar, and in saying so I do not want to convey the idea that we advocate the extraction of second molars, for in the majority of cases we do not.

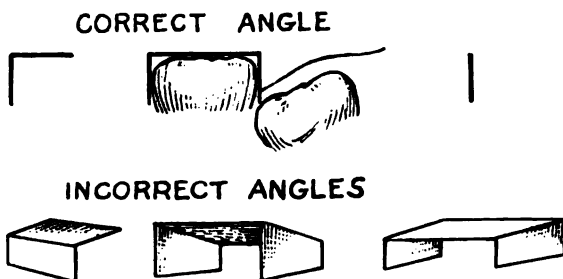


Fig. 1.—A thin (.003 inch) indicator placed over a tooth and between other teeth to show angle of rays.

Here is the relation of the teeth to the inferior dental canal. It shows the bone as well as the right angle affecting the jaw in an obtuse angle. We want to know many times whether a tooth is lapped over other teeth.

Speaking of the radiographer, I want to say that a busy orthodontist has no time to bother with x-rays. The orthodontist should engage the services of a radiographer who knows how to take radiograms properly. I conceived the idea of using metal between the teeth, allowing it to extend over the top of the tooth, so that we had in the picture, if correct, a perfect right angle view. If the picture were distorted or taken off at an angle (illustrating) we would see a broad surface and not a straight line. If the radiographer found the broad surface on one side or the other he would take the picture over. I had to know that the picture was taken at a right angle to determine whether the tooth was overlapping or not.



Fig. 2.—Sixteen years. Room for third molar eruption.



Fig. 3.—Thirteen years. Third molar impaction.

# **ABSTRACT OF CURRENT LITERATURE**

**Covering Such Subjects as**

**ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY**

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

## **Mandibular Bone-Grafts. C. W. Waldron and E. F. Risdon. Proceedings Royal Society of Medicine, London, 1919, xii.**

In the early treatment of mandibular compound fractures with loss of bone substance, persistent efforts should be made to keep the mouth as clean as possible by frequent mouth washings and irrigation of pockets and sinuses. All sinuses should be freely drained and any attached comminuted fragments should not be disturbed until they become separated and remain as sequestra. Displaced fragments should be corrected and held by dental splints for two months or more. Teeth too near the line of fracture or those predisposing to infection of the wound should be extracted, but those which will be of service in immobilization of the parts when the graft is placed should be preserved. The date when all external and alveolar sinuses have definitely healed should be noted as no operative procedure should be undertaken until at least six months have elapsed after the complete disappearance of all inflammatory processes.

At least a week before the operation the dental splints should be cemented to the teeth in order that the mucous membrane of the mouth may become accustomed to them. The anæsthetic used is ether oil administered by rectum and ether administered intrapharyngeally through a nasal tube. After the field has been prepared with ether and iodine, a sterile dental rubber dam is fixed to the cheek and lower lip with adhesive. By turning this upward, the mouth is walled off and soiling by saliva is prevented. At the conclusion of the operation the rubber dam is turned down over the wound as a part of the dressing.

One type of graft is illustrated by the accompanying drawing. The incision is made so that it will be below, rather than over, the graft. The non-touch method is used. The ends of the fragments are exposed  $1\frac{1}{2}$  to 2 centimeters back and great care is taken not to perforate into the mouth cavity. The ends of the fragments are trimmed back until good, healthy, bleeding bone is reached. All cicatricial tissue should be excised. The rongeur forceps are used in preparing the graft and fragments. The ends of the fragments are squared off as well as possible, leaving a ledge above the graft which affords additional surface contact between the fragments and graft. When one end is well forward, an overlapping joint or a notching of the posterior fragment may be advantageous. The

iliac crest is exposed and a piece of the proper size removed with small chisels and thin saws. Usually there is considerable free hemorrhage which will require drainage of, and firm pressure to, the wound to control it. From this site, a shape suitable to the requirements of the case may be had with the minimum amount of modeling. Holes are drilled into the ends of the transplant and ends of the fragments, and short pieces of Belgian wire are threaded through and tightened. The subcutaneous tissues are closed with interrupted catgut and the skin closed with horsehair after all hemorrhage is controlled.

On account of the wound of the iliac crest the patients are kept in bed for ten days. The diet is at first liquid, then semisolid. Splints are left on for from three to four months, and removed only when the progress, as shown by the x-ray, is satisfactory.

In reviewing the cases the author concludes: (1) that restoration of function may be expected in a large percentage of cases; (2) that both surgeon and dental surgeon must give careful attention to the case to the final stage; (3) that the iliac crest is best suited for grafts of mandibular fractures; and (4) that good contact of grafts to fresh healthy bone and the maintenance of the graft in position by wiring is essential.

**Results of Bone-Grafting Operations in the Treatment of Ununited Fractures of the Mandible.** W. Maxwell Munby and A. D. E. Shefford. *The Lancet*, London, 1919, June 21, i, p. 1070.

The results obtained by bone-grafting operations in the treatment of ununited fractures of the mandible, in the Northern General Hospital, Leeds, England, are reported by the authors on account of the great odontological importance of these observations. In their earlier cases, the free graft was invariably used, while in the later cases, a pedicled graft from the mandible (as introduced by Percival Cole) was adopted. Better results are obtained by the use of the pedicled grafts than by free grafts in that the former considerably shorten the period between the actual operation and the establishment of union. Where there are no teeth in the posterior fragment, the best results are also obtained by use of the pedicled graft. Certain cases where there is a large gap between the fragments are not suitable for a pedicle graft, especially when both ends of the fragments are pointed. In such instances a free graft is preferable. In free grafts the best results are obtained when the graft can be wedged into position and the periosteum stitched with fine catgut. The graft was obtained from the crest of the ilium in the majority of the cases.

Ununited fractures of the mandible, the result of gunshot injuries, are divisible into two classes, those having teeth in both fragments, and those having no teeth in the posterior fragment. In those cases where there is an absence of teeth in the posterior fragment, the operation is only indicated when the pseudoarthrosis is very lax, and marked improvement can be obtained, even if union of the graft is imperfect. Where there is already firm fibrous union causing little or no disability, the operation is not indicated. Bone-grafting operations give the best results when there are teeth in both fragments, which can then be completely controlled by a splint; eight of nine such cases were united at the end of

ten months. Absence of wound infection is an essential in order to secure satisfactory results. The amount of scar tissue present in the area of operation does not appear to influence the result, except that a slight sloughing of the skin flaps may occur when it is abundant. Bony union was obtained in ten of seventeen cases, equaling 59 per cent.

Radiographs in fractures at the angle region of the mandible are deceptive, inasmuch as they do not show the true extent of the size of the gap, which is frequently greater than it would appear, owing to the fact that the posterior fragment generally becomes displaced and lies at a deeper plane than the anterior fragment.

**Teratoma of the Maxillary Antrum.** H. E. Velarde. *Philippine Journal of Science*, 1919, xiv, No. 1, p. 161.

The case described was that of a 14-year old girl. The condition was of several years' standing, there being an increasing prominence of the right face. The right maxilla in the region of the antrum of Highmore was found to be prominent and bulging, extending to the side of the nose. There was no inflammation nor was there tenderness on pressure. A skiagram showed the presence of a tooth in the antrum. A radical operation was performed, the antrum being opened by a blow on a chisel, the membranous sac (containing fluid) was incised, and the sac and the single-rooted tooth buried in the roof of the antrum and the floor of the orbit were removed. An opening into the nose was left for drainage. The pathological examination indicated that the tumor mass was of the nature of an enamel organ or adamantinoma. The location is unusual.

**Treatment of Ununited Fractures of the Jaws, Resume of Work Done by the Dental Department, U. S. A. General Hospital No. 11, Cape May, N. J.** D. H. McCauley and D. L. Worthley. *Dental Cosmos*, 1919, lxi, p. 391.

War surgery has presented problems and difficulties quite different from those met with in civil practice and of these the dental surgeon has had his full share, particularly in the treatment of fractures of the jaws due to gunshot wounds.

In civil life, fractures of the maxilla and mandible are seldom complicated by a loss of substance. In war injuries, however, such a loss is the rule rather than the exception.

In the cases reported the patients had received their wounds from six weeks to four months previous to the time treatment was begun. Only a few were not in good condition, in spite of the fact that there was a lack of proper materials for treatment. Splints had to be devised from 2-franc pieces, chicken wire, telephone wire, and any other malleable metal which could be obtained.

Immobilization for from three to four months was always necessary to secure union when there was a loss of substance. Such immobilization should be instituted with the muscles relaxed and the jaws in the position of rest. The danger of trismus following immobilization is very slight.

To force the jaws apart gradually the authors suggest the use of a simple

tapered screw which can be adjusted by the patient himself. As the muscles seem to contract more at night during normal sleeping hours than at any other time, the patients were given a cork with a wire attached to place between the teeth before going to bed. Larger corks were substituted at regular intervals.

Food and fresh air are important factors in the successful treatment of any fracture. When the jaws have been immobilized, the food must, of course, be liquid or semi-liquid.

The authors report many interesting cases of fracture of the jaws which were treated successfully.

**Mandibular Bone-Grafts.** C. W. Waldron and E. F. Risdon. *The British Journal of Dental Science*, 1919, lxii, p. 201.

During the past three years, the surgeons doing this work have made a careful and uninterrupted study of all the various phases of the problems arising in cases of severe fractures of the lower jaw. With special reference to the transplantation of bone, the consensus of opinion appears to be that the transplanted bone has varying, but extremely important, osteogenetic properties. Bone-grafting of the lower jaw is an operative procedure whereby union of the fracture and restoration of function may be expected in a large percentage of cases. Complete co-operation and careful attention to every detail by the dental surgeon and the surgeon concerned, are essential from the early treatment to the final stage. Full advantage should be taken of the osteogenetic activity of the fragments, and of the transplanted bone, and also of the osteo-conductive properties of the latter. The iliac crest is, in the authors' experience, best suited in most cases for the bridging of defects in the lower jaw. The operation should be made as simple as possible, the object being to obtain good contact of the graft to fresh healthy bone of the fragments, maintaining the same firmly in position by wiring. The iliac crest graft is easily obtained, is very cancellous, strong, and particularly adaptable, as any surface may be used. The crest is easily exposed, and the required amount removed by thin chisels and narrow saws. Hemorrhage may be free, necessitating firm pressure and the insertion of a rubber-tube drainage. The graft is readily trimmed and fitted to place. Holes are then drilled in each end of the transplant, through which are threaded the wires previously inserted in the ends of the fragments. These are then tightened, fixing the graft firmly in position. The subcutaneous tissues are then united with interrupted mattress catgut sutures, and the skin is closed with horse-hair after bleeding has been controlled.

**War Injuries of the Face.** W. Rosenthal. *Ergebnisse der Chirurgie und Orthopaedie*, x, 1918.

Cooperation between surgeon and dentist is essential for the best possible results in these cases. Early treatment is of the greatest importance in facial and jaw injuries, a splint attachment being useful in the latter, so as to prevent displacement of the fragments while allowing the mouth a certain amount of gape. A correct technic is imperative, with attention to rigorous asepsis, com-



plete hemostasis, and systematic after-treatment. Defects of the lips should be repaired as a general rule with tissues from the upper lip in the case of lower lip lesions, and vice versa, supplemented by tissue from the cheek region. In the treatment of palatal defects, all closure by means of obturators and dental appliances is rejected by the author, in whose opinion all such defects of any size and in any position, admit of closure by plastic procedures. A pedicled flap including the whole thickness of the cheek is recommended for very extensive palatal defects, but with a more or less intact alveolar border. The flap is turned inwards to cover the opening, the wound in the cheek being brought together around the pedicle. At a later date, the pedicle is completely divided, in order to assist the desired transformation from external skin into oral mucosa and to favor efficient innervation from the palate. In bone-graft reconstruction of jaw fragments, a pedicled slide-graft can be obtained from the region of the mandibular angle or from the symphysis, or in the case of greater defect, from the opposite side. There is no limit to the size of free bone grafts for the jaw, which may be secured from the jaw itself, the ribs, the clavicle, the ilium, the tibia, and the metatarsus. In a general way, the ilium and the tibia would seem to be the most advantageous sources of the graft. The operative technic is of decisive importance, and the periosteum must be carefully preserved, guarding against its infiltration in case the work is done under local anesthesia. The graft is preferably transferred directly to its new bed, without preliminary immersion in solutions of any kind, and without any unnecessary handling. The periosteal edges are then united by catgut sutures, an important step in the operation, although the freshened end of the jaw fragment with its medullary tissue may also participate in the final union of the graft. Appropriate employment of free bone-grafts is often followed by perfect union and excellent functional results.

**Ankylosis of the Jaw Due to Fixation of the Temporal Muscle.** Gordon B. New. *Journal American Medical Association*, July 25, 1919, lxxiii, No. 4, p. 264.

It is sometimes difficult to determine definitely the side involved and the location of the fixation of an ankylosis of the jaw. This is particularly true in cases in which the jaws are fully formed before the ankylosis has occurred and in which there is no deformity. The diagnosis of the location is not so difficult when the fixation has occurred early in life, causing the deformity typical of such cases. Ankylosis of the jaw may be said to be of three types: (1) articular ankylosis, the most common type, due to the involvement of the temporomaxillary joint, (2) extra-articular ankylosis, in which the extra-articular structures or muscles are the cause, and (3) articular-extra-articular ankylosis, in which both the joint and the extra-articular structures are at fault. The clinical points of value in determining the side involved and the location of the ankylosis have been brought out in a recent article. The treatment of the articular type of ankylosis gives uniformly good results. It consists of an arthroplasty of the temporomaxillary joint through a curved incision 2 inches long, extending above the zygoma and down in front of the ear, and the removal of at least one-half inch of the

condyle and the ascending ramus of the jaw. It is not necessary to interpose any tissue in the new joint. When the jaw is not deformed, the operation is not difficult. If the typical deformity of ankylosis developed early in life is present, the joint will be very low and should be attacked from above by removing the lower margin of the zygoma. In this way the facial nerve is avoided, which is liable to injury if care is not taken in making the dissection in the soft tissues. The treatment of the extra-articular and the articular-extra-articular types of ankylosis are much more difficult and present many problems.

**Relation of Dental Affections to Systemic Diseases. A. Stengel. The Dental Cosmos, 1919, lxi, No. 7, p. 619.**

It is only recently that attention has been paid to the roots of the teeth as localities from which general infection can occur. These deep-seated, hidden, and incarcerated abscesses about the roots of the teeth are far more apt to become the source of generalized infection than are superficial conditions such as gingivitis or pyorrhea. Root abscesses become increasingly important in the involutional period of life, in the forties, fifties, and sixties. Whereas infections of the soft tissues are threatened in youth, infection of the alveolar process is to be anticipated in patients past forty years of age. Among the diseases due to oral or dental infection, the following are especially noteworthy: (1) Chronic anemia. (2) Chronic arthritis. (3) Chronic nephritis, Bright's disease. (4) Myocarditis; that is, weak heart. (5) Recurrent or relapsing endocarditis, or infection of the heart-valves. Beginning in adult life, an indefinite anemia, even approaching pernicious anemia in type and severity, is not infrequently referable to root infections. Elderly people in a chronic state of ill health are apt to be suffering from focal infection somewhere in the body. As a rule, these patients are anemic, and the cause of their secondary anemia should be sought for in the oral cavity, among other places. Oral infection is often, but by no means invariably responsible for the forms of chronic arthritis known as arthritis deformans. A case of vertebral arthritis, with pains radiating along the intercostal nerves, and chronic nephritis with albumen and casts in the urine, under the author's personal observation, was undoubtedly referable to infection disseminated from the mouth. Complete recovery followed within some months after the removal of all the patient's teeth, which were literally swimming in pus. The mouth is also an important but not invariable source of infection of the heart-muscle. Patients suffering from valvular disease of the heart must carefully guard against re-infection of the damaged valve, by exercising the greatest care about the mouth, the pharynx, the teeth, etc. The invasion of the streptococcus viridans, whose frequent habitat is in the mouth, is likely to re-infect an already damaged and less resistant heart.

Concerning root abscesses, it is necessary to make a distinction between an abscess that is infecting the system and one that is not, the latter can perhaps be drained and treated, with preservation of a valuable tooth. "There is no kind of thing that men are not attributing to root abscesses. A patient develops iritis, glaucoma, or panophthalmitis. These are all manifestations that may mean gout, arteriosclerosis, or syphilis; and yet some one is willing to say the con-

dition is due to a root shadow, and he takes the tooth out. Teeth should not be sacrificed in this haphazard way; and, worst of all, the obsession that oral infections explain everything should not lead us to overlook much more serious conditions." "The author, who has seen an instance in which a bad place in the x-ray plate was thought to be a bad abscess that did not exist, emphasizes that we must be more skeptical concerning the work of the x-ray artist; we should be less complacent, and not accept it lightly when there is a tooth to be sacrificed."

While a conservative radical method in the form of root amputations may be expected to cure many cases of root-abscess, the end result of the use of sera and vaccines in the treatment of root-abscesses will presumably prove wholly unsuccessful.

**Pyorrhea and Autogenous Vaccines.** G. M. Hoffman. *Medical Sentinel*, 1919, xxvii, No. 8, p. 991.

In reviewing 100 cases of pyorrhea alveolaris, each of which was examined from a direct smear of pus, plus cultures, the predominating organism of the infection was found to be streptococci pyogenese. The staphylococci, usually aureus and albus, was present in 30 per cent of all cases. Spirochetes, fusiform B. mould fungus and some diplococci are frequently found associated with the streptococci pyogenese. It has been the author's practice to treat these cases with autogenous vaccines of streptococci pyogenese, eliminating the extraneous organisms above cited. It may be of interest to note in but ten cases the ameba buccalis was found, which organism for years was believed to be the causative of the majority of cases of pyorrhea.

**Trench Mouth.** H. L. Merkeley. *Oral Health*, 1919, ix, No. 7, p. 243.

This condition is well described by the designation as ulcerative interstitial gingivitis. A lack of oral hygiene is generally conceded as a contributing factor, and badly kept table utensils undoubtedly help in the distribution of the infection. Streptococci, and a very few staphylococci have been found, as well as anaerobes in the form of the bacillus fusiformis and its spirochaete, said to be a spore form of the bacillus fusiformis. Certain other ultra-microscopic forms are regarded by the author as chiefly responsible. The infection spreads with great rapidity and then assumes a stubborn chronic character. The clinical picture presents a slough closely approximating in general appearance that of an arsenic necrosis. The floor of the mouth, tongue and cheeks are rarely involved, although there is a considerable rise in temperature of the cheeks in acute exacerbations. There is also a general rise in temperature of a couple of degrees, due no doubt to the absorption of ptomaines and toxins. Pain may be severe enough to produce insomnia. The chief aim in the treatment being the removal of the cause and all contributing factors, the slough is best cleaned away by applying dry crystals of copper sulphate on a small pledget of cotton to each interproximal space where slough is present. The bactericidal application is allowed to remain three or four minutes, then washed out with a water syringe, this treatment to be repeated daily for three or four days, or if pain be intense, twice

daily. As a mouth-wash, undiluted Dakin's solution should be prescribed, with instructions to the patient to hold the solution in the mouth for some minutes, and use the cheeks to forcibly wash out the interproximal spaces. When the pain has disappeared and the slough has been cast off, which should be in four to five days, a thorough examination should be made for all irritants, and these should be removed even to the removal of all shell crowns and extraction of the third molars, if badly involved. It is noteworthy that the tissue flap covering a partially erupted third molar may form a pocket and thus become the seat of trouble. In fact, fifty per cent of cases treated to date point to this origin. Treatment by irrigation and wash should be continued until granulation-tissue has a good start, then iodine and violet ray massage may well be employed, keeping up the Dakin solution as a mouth wash intermittently. The destroyed gingival tissue will slowly regenerate, and give a fairly good effect even in extensive necrosis.

**Radiography in Dental Diagnosis and Treatment.** L. H. Woodroffe. *British Dental Journal*, 1919, xl, No. 13, p. 505.

The following classification of the indications for dental radiography is offered by the author on account of its simplicity and comprehensiveness:

1. Septic and inflammatory conditions, including (a) *Pyorrhea alveolaris*; (b) chronic rarefying osteitis; (c) alveolar abscess, acute or chronic; (d) fistula; (e) pericemental abscess; (f) empyema of antrum; (g) bone necrosis.

2. In orthodontia, including: (a) Late eruption of teeth, possibly due to absence of permanent teeth; (b) in cases of supernumerary teeth; (c) in cases of impaction; (d) determination of position of secondary teeth.

3. Root canal treatment, including: (a) Preliminary examination to determine the position and direction of roots, and subsequently (b) to see if filling has been correctly performed.

4. Root resection.

5. In all crown and bridge work: Not only should an examination be made before commencing work, to ascertain the condition of the teeth concerned, but an examination of any crowned teeth some months after the work has been done will lessen the large number of unhealthy teeth met with. A preliminary examination of the skiagrams of these teeth will also facilitate matters in respect to the treatment of root canals.

6. In making a general radiographic survey of the mouth, whether at the request of the careful dentist who wishes to be sure that no hidden trouble is present, or at the request of the physician who is faced with some nervous, alimentary or other disorder of obscure origin.

7. In oral surgery, including: (a) Extractions which, when unusually difficult, will be facilitated by a radiograph of the position and direction of the roots; (b) in cases where after extraction curettage may be necessary; (c) in cases of fracture; (d) in gunshot wounds; (e) in cases of cysts and tumors of the maxillae, whether malignant or benign.

As regards the examination of the mouth for septic or inflammatory conditions, intra-oral films are as a rule the most satisfactory, as the fine detail re-

quired for the recognition of these diseases is more easily obtained by placing the film in the mouth. This method should always be followed, though occasionally the exposure of a plate will give material assistance, as for example in suspected empyema of the antrum, where a special exposure giving a comparative view of the two antra should be made. In cases of fistula, stereoscopic exposures on extra-oral plates and on intra-oral films will frequently throw light on the course of the sinus and the cause thereof, the fistula being previously injected with a bismuth or similar opaque preparation. The presence of necrotic fragments of bone or broken and buried roots will also frequently be found to repay the increased trouble of stereoscopic exposures on plates or films. It is, however, in regulation work that the value of extra-oral exposures is most often seen, these being followed when found necessary by the exposure of intra-oral films as well. In regulation cases it will often be found that the information obtainable from a single exposure is misleading and a stereoscopic exposure will at once make the task of the dentist more simple.

From the viewpoint of orthodontia, radiography will at once settle the question as to the presence or absence of secondary teeth; if present, the stage of development reached and the approximate size of the unerupted teeth will be available, and from this the space necessary for their proper eruption can be judged. The direction in which the teeth are advancing and their approximate line of occlusion can be decided by means of a radiograph exposed at the right time, and occasionally by making attachments to unerupted teeth more can be done to regulate their advance than would otherwise be possible. The correct time for the extraction of deciduous teeth can also be determined. Finally, much may be done to avoid the overcrowding of teeth and faulty occlusion due to the malposition of third molars. Misplacements of these teeth are common, and cases of impaction and abnormality of roots will at once be brought to light by a skiagram of the area. In these cases it is very desirable to make stereoscopic exposures. Frequently an impacted and unerupted third molar will give rise to serious nervous disturbances, and such a tooth may only be discovered and its extraction enormously simplified by a radiographic picture of its relations.

The value of the x-ray in cases of fracture, of the formation of sequestra, and of loss of bone after shell and gunshot wounds is obvious, as it is also in cases of tumors of various types, and of salivary calculus. In these cases plates should in all cases be exposed, and inasmuch as in a large proportion of these conditions a clearer conception of the state of affairs can be obtained by a stereoscopic view, stereoscopic exposures should be made as a routine.

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## ORIGINAL ARTICLES

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### ANCHORAGE PRINCIPLES IN MODERN ORTHODONTIA\*

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THE forms of orthodontic appliances and the technic of their adaptation have quite materially changed in the last few years, the variety of forms ranging from the simplest to the most complex, from those utilizing inclination movement in whole or part to those embodying the principles of bodily movement of the teeth in whole or part; screw force has given place to spring force to a great extent; the lingual arch bids fair to displace the labial arch in many cases; the size of the expansion arch is diminutive in diameter, and the finger spring is often substituted for the silk or wire ligature; fixed appliances have in a sense become removable, and removable appliances have become fixed; and the gold and platinum or precious metal appliance has superseded that made of nickel silver.

Thus, the evolutionary cycle through which appliances have traveled is about complete, and the question arises as to whether all of these various changes in construction and method will stand the test of the principles of mechanics governing the application of forces to the teeth, especially the principles of anchorage.

Basic principles always endure, and in the application of the basic principles underlying anchorage to the best known and proved appliances of today, the answer to this question may be found, and the *principles emphasized*, which is the object of this paper.

To begin with, the appliances used for orthodontic treatment, being similar in principle to certain machines in use outside of the mouth, are necessarily amenable to the same laws or principles of mechanics which govern the action of applied forces in general.

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\*Read before the Alumni Society of the Dewey School of Orthodontia, St. Louis, Mo., March 6-8, 1919.

However, the limitations in the quality and quantity of the applied forces in the mouth, because of the danger of injury to the living elastic tissues involved, present a striking contrast to the application of similar forces in the field of general mechanics where physiologic considerations are unknown, and where force and resistance may be accurately measured. For example, in the field of applied mechanics in the arts, a force operating from an unstable resistance would not be considered practical, but, in the application of forces to the dental and alveolar tissues, the mechanical problems are not infrequently solved by the operation of a force from a more or less unstable base.

Stability in applied forces, or in the resistance to these forces in the mouth, can therefore never be regarded in the absolute, but it must be theoretically assumed in the mechanics of orthodontia in order that the nearest approach to absolute stability may be obtained through the application of the principles of mechanics governing force and resistance.

Hence, Newton's law, that *action and reaction are equal and opposite*, may be relatively applied to the action and reaction of force producing appliances upon the teeth, and from this principle of physics has been deduced the foundation principle in the mechanics of orthodontia, viz., that *the resistance in the anchor teeth, or basal resistance, must always be greater than the resistance at the points of delivery of the applied force*.

*Stability in anchor teeth* is the object of the application of this basic principle in physics, but as before stated, the comparatively unstable quality of the tissues in which the teeth are embedded makes it impossible to consider stability as an absolute factor in anchorage. Therefore, in the descriptions of some of the various forms of anchorage which follow, *stability of resistance* will be considered as *relative* only, though as near the *absolute* as the conditions will allow.

Furthermore, the *stability* of teeth used for anchorage varies with their power of resistance, which is determined by their use singly or in groups, by their size and location, the length and number of their roots, the period of development of the dental arches, as well as by the manner of application, the magnitude, and the direction of the applied force.

Thus, the whole foundation of the principles of anchorage is primarily based upon the utilization of sufficient passive and stable units of resistance in the anchor teeth to oppose and counterbalance or overcome the units of resistance in the teeth to be moved through the application of force, although this idea of anchorage has been modified to meet modern anchorage requirements in which the anchor teeth themselves take part in the tooth movement in conjunction with other teeth in the dental arches.

However, the resistance in the basal anchor teeth, including the choice of anchor teeth of larger size and more favorable location, the opposed resistance of teeth of less size and less favorable location, the reenforcement of the resistance of basal anchor teeth, the reciprocation of resistance of basal anchor teeth on opposite sides of the dental arch, and the adjustment of resistance values to secure proper control and direction of force, must be seen to be in each case, the *accurate selection of resistance units according to the requirements*, which is the essential factor in the following definition of anchorage:

*ANCHORAGE* consists in the selection of adequate and properly distributed resistance units for the control and direction of force applied to the teeth for dental arch development or for lesser tooth movements.

According to this definition the selection of resistance at the points of delivery of a force is as much anchorage as the selection of basal resistance in the anchor teeth, and this new interpretation of anchorage so extends its scope that the formerly undesignated points of application of the force may be properly designated and defined as they should be.

In the modern evolution of anchorage principles, it has become of paramount importance to thus distinguish between the resistance at the basal anchorage of the appliance and the opposed and often reenforced resistance at the other points of delivery of the force.

#### PRIMARY AND SECONDARY ANCHORAGE

In an attempt to more completely analyze and designate the various points of selected resistance in the dental arch for use as anchorage, I have first designated *all points of attachment or delivery of force to the teeth as anchorage*, as in the definition, the selected *basal resistance* being designated as *primary anchorage*.

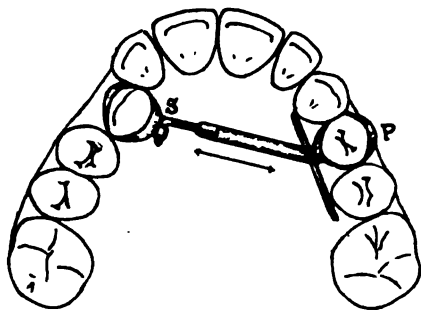


Fig. 1.

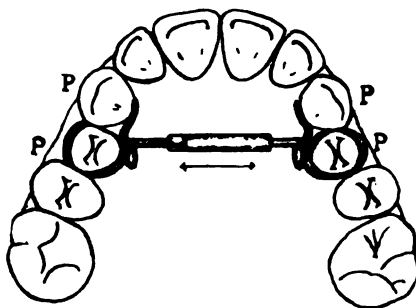


Fig. 2.

*age*, and the points of *selected lesser resistance*, opposed to the basal resistance at other points of delivery of the force, as *secondary anchorage*.

To simply illustrate these designations of primary and secondary anchorage, an appliance such as the jackscrew, delivering force in one direction only, will serve, although as an appliance for modern orthodontic treatment, it is out of date. In the more complex appliances of today, the application of force in the arc of a circle in innumerable different directions does not lend itself as readily to the elementary designations of primary and secondary anchorage, although it will be later shown.

Thus, in the attachment of the jackscrew across the dental arch, Fig. 1, although an appliance seldom used today, the *primary anchorage* is located in the bicuspid *P* and its reenforcements, the *secondary anchorage* being located at the point of delivery of the force in the cuspid *S*, where on account of the pivotal nature of the attachment, and the opposition of one tooth to three in the basal anchorage, a lesser resistance is established.

If the jackscrew were to be used directly across the dental arch, being attached on each side to bicuspids of equal resistance, even when reenforced, as in



Fig. 2, the resistance on one side would be equal to that of the other on the application of the force of the jackscrew, hence, there would be no points of *secondary anchorage*. In effect there will be established the reciprocation of the resistance of *two primary anchorages*. This same reciprocation of two *primary anchorages* may be observed at any location in the line of the arch where two or more teeth of equal resistance are opposed to each other in anchorage, as in the opposing of two centrals in an anchorage established for their equal mesial movement, Fig. 3.

However, if the resistance of two or more teeth along the line of the arch is opposed to one of lesser resistance, a *primary anchorage* would be established in the anchorage of greater resistance, and a *secondary anchorage* in the anchorage of lesser resistance, as illustrated in Fig. 4 in the selection of anchorage resistance for the mesial movement of the left lateral incisor by the closing of the spring loop between the anchorages of greater and lesser resistance P and S.



Fig. 3.



Fig. 4.

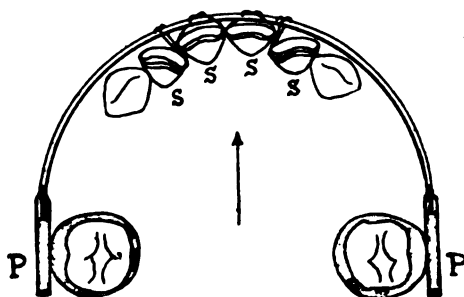


Fig. 5.

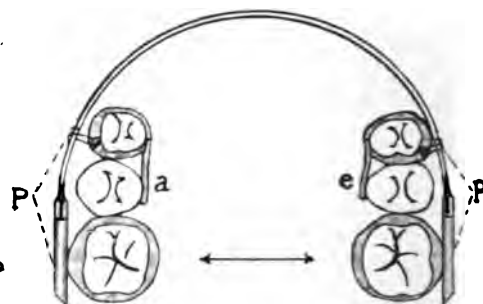


Fig. 6.

In a more complex tooth movement, such as the movement of incisors forward with the expansion arch, the *basal resistance* is *divided* between the *points of support* of the expansion arch, as in Fig. 5, in which the two molars constitute the *primary anchorage* supporting the expansion arch and directing its force against the lesser points of resistance at the points of delivery of the force in the incisors where the *secondary anchorage* is established. If lateral expansion in the molar region is also instituted, there would exist the opposition of the *primary anchorage* on one side to that of the *primary anchorage* on the other, or the establishment of a *reciprocal anchorage*, if the resistance on each lateral half is the same.

The addition of the bicuspid to the *primary anchorage*, in lateral expansion, as in Fig. 6, if the resistance added on each lateral half is equal, simply reinforces, and is included in, the *primary anchorage*.

In case that a greater resistance is intentionally established on one lateral half than on the other for the purpose of moving teeth in the lateral half in which the lesser resistance is established and restricting or inhibiting tooth move-

ment in the opposing lateral half as in Fig. 7, a *primary anchorage* is secured in the lateral half of greater resistance, and a *secondary anchorage* in that portion of the lateral half in which the lesser resistance obtains.

Furthermore, points of *primary* and *secondary* anchorage may be established along the line of the expansion arch for special tooth movements in a particular location as in the anchorage established for the buccal movement of a bicuspid in lingual occlusion, as in Fig. 8. The primary anchorage  $P^1$  and  $P^2$  is partially located in the arch wire, and is opposed to the lesser resistance of the *secondary anchorage* of the lingually occluding bicuspid which is ligated to the arch. It is not uncommon to thus locate part of the *primary anchorage* in the resistance of a heavy base wire, as in the larger gauge expansion arch of Lourie's with delicate finger springs.

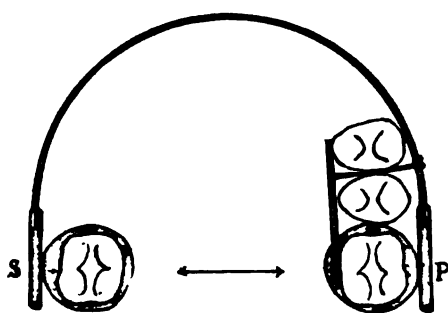


Fig. 7.

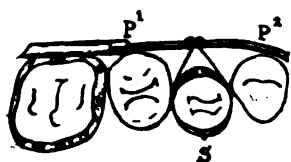


Fig. 8.

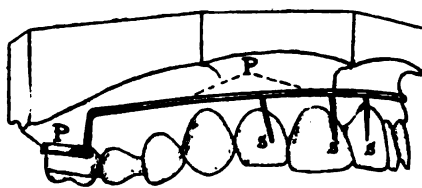


Fig. 9.

Fig. 9 exhibits the *primary anchorage* in Lourie's expansion arch located partially in the anchor teeth and partially in the heavy, almost rigid base wires from which are extended the delicately tapered springs to the points of *secondary anchorage*.

#### PRIMARY AND SECONDARY ANCHORAGE WITH LINGUAL ARCH

The same conditions of greater and lesser resistance hold good in the use of the lingual arch whether it be the pinched lingual arch of Lourie's or the removable lingual arch of Mershon's with or without finger springs.

In Mershon's lingual arch in which the base wire is constructed, of .036 in. wire or 19 gauge B & S in diameter, and the auxiliary finger springs of .021 in. in diameter, as in Fig. 10, the base wire is not necessarily changed in shape from the beginning to the end of the treatment although it is occasionally done and if *not*, it is part and parcel of the *primary anchorage* established in the molars. The teeth acted upon by the finger springs constitute the *secondary anchorage*

as being the points of lesser resistance to the applied force of *inclination* movement.

In Mershon's lingual arch without finger springs, as diagrammatically illustrated in Fig. 11, the operating force is in the base wire itself, and as the bends conforming to tooth malpositions are straightened out, the pressure of the

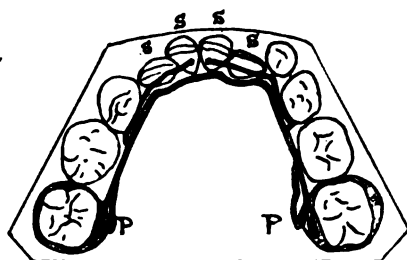


Fig. 10.



Fig. 11.



Fig. 12.

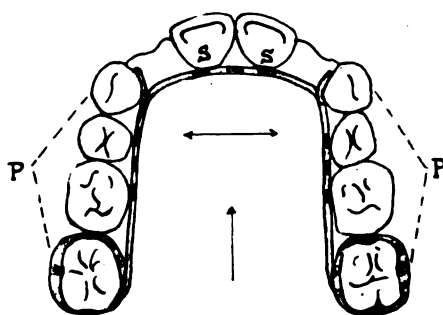


Fig. 13.

spring wire on the lingual surfaces of the anterior teeth causes them to move. The anchorage upon the molars is constructed so that the resistance is greater through the vertical half round lock than the resistance of the incisors to labial inclination movement so that a *primary anchorage* is secured in the molar region and a *secondary anchorage* in the incisor region.

Fig. 12 illustrates a modification of Mershon's lingual arch in which the resistance in the incisor region is made a little more positive by banding the laterals

and attaching lingual spurs, but it is still a selected lesser resistance, and, therefore, a *secondary anchorage*.

In the pinched lingual arch of Lourie's, Fig. 13, the *primary anchorage* is similarly located in the banded molars and the *secondary anchorage* in the anterior teeth when the wire is pinched for forward movement. If in either the Mershon or Lourie lingual arch, force is applied for lateral expansion, the *primary anchorages* on each lateral half are pitted against each other, and other teeth along the side of the dental arch may be included in the *primary anchorage*.

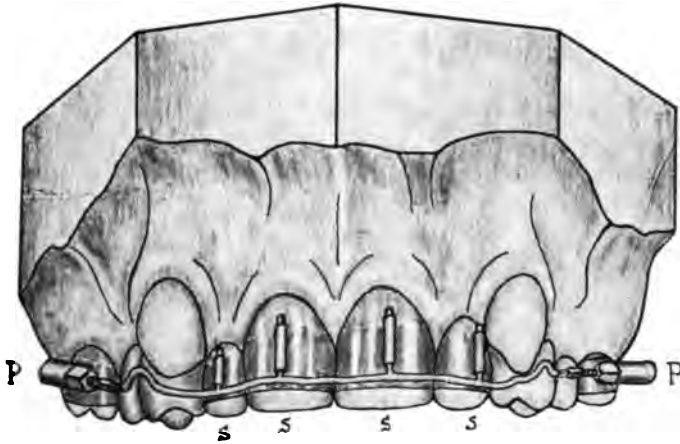


Fig. 14.

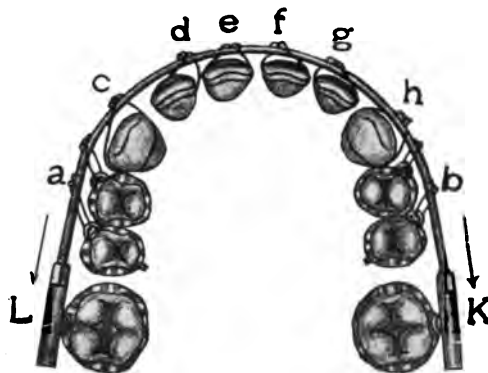


Fig. 15.

In the labial expansion arch with pin and tube attachments with the Angle-Young lock on the molars, as illustrated in Fig. 14, the same conditions of primary and secondary anchorage hold good as in the plain labial expansion arch, or in the lingual arch, for as long as the basal attachments in the molar anchorage are non-pivotal, and the force applied for the bodily movement of the incisors is infinitesimally increased from time to time, the resistance in the molar region will continue stable during the movement of the anterior teeth, and a *primary anchorage* is thus established at points *P* and *P* in the molar region, and a *secondary anchorage* at the points of lesser resistance *s*, *s*, *s*, *s*.

## REVERSAL OF BASE OF ANCHORAGE

Occasionally it is necessary to reverse the usual base of anchorage of an appliance and use the teeth as *primary anchorage* which under ordinary conditions would be used as *secondary anchorage*. For example, in Fig. 15, the reversal of the base of anchorage from the molars to the anterior teeth is purposely effected so as to move the second molars distally. This is done by ligating all of the teeth to the expansion arch and reducing the resistance of the molars to distal movement by means of a pivotal anchor tube on each second molar. In this manner the *primary anchorage* is located in the anterior teeth and the *secondary anchorage* in the second molars.

It is, of course, also possible to reverse the base of anchorage with other types of appliances than the plain expansion arch, such as the pin and tube appliance, and great care must be observed in its use to see that the base of anchorage is not unintentionally reversed.

From the foregoing descriptions of *primary* and *secondary anchorage* it will be seen that they are *not* forms of anchorage, but rather designations of the distribution of anchorage resistance according to the mechanical and physiological requirements of treatment.

Up to this point in the study of the principles of anchorage, stress has been laid upon the *selection of anchorage resistance* and its distribution in the dental arches as *primary* and *secondary anchorage*, based upon the varying degrees of resistance of the teeth themselves, and the osseous structures in which they are embedded. Anchorage resistance has been considered chiefly from its physical aspects in comparing the resistance values of the teeth themselves, according to their size and location, their periods of development, and the necessities of treatment.

A further consideration of the principles of anchorage deals with the *added resistance mechanically obtained by the method of attachment of the appliance* and the *scientific building up of anchorage by mechanical means*.

## MECHANICAL REQUIREMENTS OF ANCHORAGE

In the mechanical building up of anchorage resistance to the application of force, the necessities of treatment must first be considered as to the degrees of resistance required in the anchorage for the *potential* and *direction* of the applied force. For example, if *inclination movement* is to be carried out, a lesser degree of anchorage resistance will be required than for *bodily movement*.

*Inclination movement* of the anchor teeth calls for a *pivotal attachment*, while *bodily movement* of the anchor teeth requires a rigid, *nonpivotal attachment* so that the anchor teeth may be moved bodily through the osseous structures. Again, if the force is applied in two directions to the anchor teeth, the resistance in the anchorage must be mechanically built up to sustain the stress in both of these directions.

Provision must therefore be made through the method of attachment to the anchor teeth for their *inclination* or *bodily movement* in both the *mesio-distal* or *bucco-lingual directions* according to the indications of treatment.

Thus, it will be observed that there may be a *minimum degree* of resistance built up in the anchor teeth through the use of an attachment requiring *inclina-*

tion movement only, and a *maximum degree of resistance* built up in the anchor teeth by mechanical means through the use of an attachment requiring *bodily movement* of the anchor teeth,

Again, the *minimum degree* of resistance mechanically built up in the anchor teeth by the method of attachment should always be *sufficiently stable* for the accomplishment of the necessary tooth movements in the dental arch other than the movement of the anchor teeth themselves, as indicated by the requirements of treatment.

For example, the *minimum degree* of resistance in the *primary anchorage* should usually be made to be *resistance plus*, or the *maximum resistance*, by mechanical reenforcement, so that it will be sufficiently stable to offset an unknown and often powerful resistance in the *secondary anchorage*. Anchor bands should be close fitting and cemented upon the anchor teeth, and anchor tubes should be attached so as to secure the maximum of resistance for use.

The attachment of the simplest appliance upon the teeth, then, requires the anchoring of the force producing appliance in such a way that the force can be continuously and effectively used to accomplish the desired tooth movements without endangering the stability of the anchor teeth to any appreciable extent.

Hence, the direction and the amount of the force exerted must be positively controlled in these attachments by a mechanically stable anchorage, the degree of stability being always proportionate to the stress of the applied force.

This necessity for the comparatively stable anchorage of a force appliance in the mouth so that its force can be effectively used and controlled, both in direction and potential, has given rise to a fundamental principle relating to the stability of appliances and their attachments, which the writer has designated the *principle of fixation*, and defined as follows:

*The principle of fixation is the general condition of stability in the delivery of force for tooth movement secured by the proper gauging of resistance values in the primary and secondary anchorage.*

The *principle of fixation* is the summing up, as it were, of all of the mechanical principles which relate to the stability of appliances for orthodontic treatment, of the quality and quantity of applied force, and of the proper proportion between the units of applied force and anchorage resistance.

The *principle of fixation* thus refers to *stability* in anchorage attachments, and in the attachments upon the teeth to be moved, and thereby to the direction and control of forces used in the development of the dental arch, or in lesser tooth movements.

A *fixed appliance*, then, is one which in its construction, takes advantage of every applicable principle of mechanics to prevent instability in the delivery of force for tooth movement.

In the observation and following out of the *principle of fixation* in the construction and attachment of appliances to the teeth, the *proper relation* between force and resistance is always obtained.

In every appliance, therefore, there must be an adequate force principle and a resistance quality in the anchorage sufficient to act as a stable base for the operation of the force. Hence, in the adherence to the *principle of fixation*, the various degrees of anchorage resistance are *selected*, from the *minimum* to the

*maximum*, which forms the *only logical basis* for the *classification* of the various *forms of anchorage*.

#### CLASSIFICATION OF ANCHORAGE

*Anchorage* may accordingly be *classified* in reference to the more definite degrees of resistance selected through the

Special Form of the Attachment Used, as	{ <i>Pivotal,</i> <i>Reinforced,</i> and <i>Stationary</i>
From the Source of Resistance Selected, as	{ <i>Intermaxillary,</i> <i>Occipital,</i> and <i>Cervical</i>
By the Reciprocation of Anchorage Resistance, or	<i>Reciprocal Anchorage.</i>

This classification is not essentially different from those with which you are already familiar, and but two forms of anchorage, *pivotal* and *stationary*, will be elaborated upon in this essay in order that they may be made more clearly comprehensible.

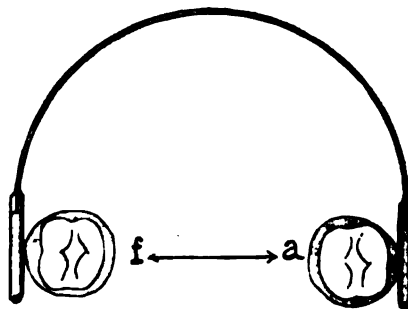


Fig. 16.

The definition, description, and illustration of these two forms of anchorage will show their special value and the reason for their consecutive sequence in the classification as follows:

*Pivotal Anchorage* is that form of anchorage in which the attachments to the primary or secondary anchorage are of a hinge-like or pivotal nature.

*Pivotal Anchorage* may be divided into two forms according to the plane of attachment to the teeth as follows:

1. *Horizontal Pivotal Anchorage* (pivotal in horizontal plane).
  - (a) Simple (pivotal in one direction in horizontal plane).
  - (b) Compound (pivotal in two directions in horizontal plane).
2. *Vertical Pivotal Anchorage* (pivotal in vertical plane).

These designations of the subdivisions of *pivotal anchorage* exactly describe them, which is an advantage in favor of the use of these terms, rather than to continue the use of some of the older terms, such as *simple anchorage*, which, would perpetuate a term which has lost its value since it represents an early form of unsupported anchorage which is not accurate enough for present day usage.

Further definition and description of these forms of pivotal anchorage, aided by illustrations, will serve to show the need for their special designation, as follows:

A *Simple Horizontal Pivotal Anchorage* is an anchorage which is *pivotal* in *one direction* in the *horizontal plane* only, as bucco-lingually or mesio-distally. An example of a *simple horizontal pivotal anchorage* may be observed in the use of *round buccal tubes* soldered to molar bands, supporting a plain expansion arch, as in Fig. 16, the force being applied buccally for expansion. The round buccal tubes allow of the rotation of the expansion arch in lateral expansion, and a consequent slight tipping of the anchor teeth in one direction only, bucco-lingually. The ligation of the incisors or other teeth to the arch, where force is applied in one direction only, is also an illustration of this form of pivotal anchorage.

A *Compound Horizontal Pivotal Anchorage* is an anchorage which is *pivotal* in *two directions* in the *horizontal plane*, bucco-lingually and mesio-distally. An illustration of this form of pivotal anchorage may be seen in the use of a *pivotal round buccal tube*, attached as in Fig. 17, so that it can pivot in either a mesio-distal or a bucco-lingual direction. This form of pivotal anchorage gives an

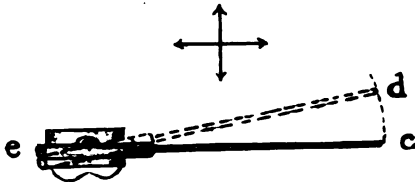


Fig. 17.

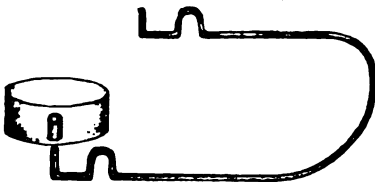


Fig. 18.

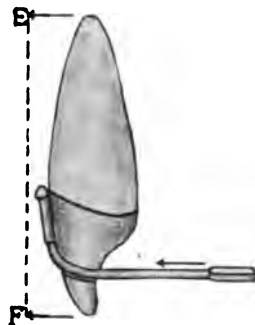


Fig. 19.

anchor tooth the greatest freedom in its movement, as it presents the least resistance to the applied force in either the mesio-distal or the bucco-lingual direction.

*Vertical Pivotal Anchorage* is that form of *pivotal anchorage* in which the anchorage attachments are *pivotal only* in a *vertical plane*, allowing of *bodily movement* of the anchor teeth, and their rotation upon their vertical axes.

This form of pivotal anchorage is observed in the use of *round vertical tubes* attached to bands upon the teeth, both in the *primary* and *secondary anchorage*.

In Fig. 18 *vertical pivotal anchorage* is illustrated in the attachment of the threadless expansion arch, the round end of the arch fitting into the round buccal tube soldered vertically to the surface of the molar band. If the round vertical tube be attached in the axial center of the band on the anchor tooth, and a lateral expanding force applied, the anchor tooth will not rotate, but will move bodily in a buccal direction; if, on the other hand, the round vertical tube be attached nearer the mesial angle of the anchor band, the application of the laterally expanding force or a distally exerted force will tend to rotate the anchor tooth.



In the *secondary anchorage* with the pin and tube appliance the use of the round vertical tube and round pin on incisor bands is an illustration of *vertical pivotal anchorage*, as shown in Fig. 19.

#### STATIONARY ANCHORAGE

The maximum bucco-lingual and mesio-distal reinforcement of a *simple horizontal pivotal anchorage* tends to increase the stability of the anchor teeth to such an extent that the nearest approach to absolute stability is secured, which may be designated as *stationary anchorage* and defined as follows:

*Stationary Anchorage is an anchorage which is so reenforced against pivotal tendencies that the attachment to the anchor teeth secures the nearest approach to an absolutely stable anchorage.*

This form of anchorage is essentially rigid so that the anchor teeth are either absolutely stable in relation to the applied force, or are moved bodily through the alveolar process in an upright position without rotation.

The resistance, for example, in a *primary anchorage* must be so reenforced

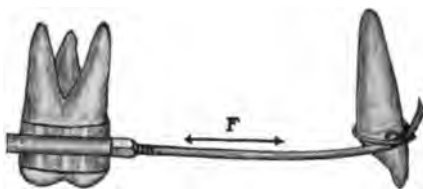


Fig. 20.



Fig. 21.

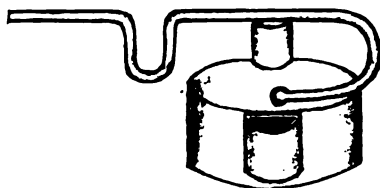


Fig. 22.

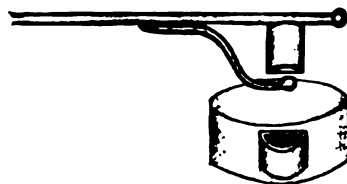


Fig. 23.

mesio-distally and bucco-lingually that tipping is impossible, and this is secured by the method of attachment. Thus, in the use of the round buccal tube soldered to the anchor band in Fig. 20, the resistance to the mesio-distally applied force is essentially stable, provided the expansion arch closely fits the round buccal tube, and in effect there is a mesio-distal *stationary anchorage* established. However, if a bucco-lingual force is exerted upon this anchorage, it is only a *simple horizontal pivotal anchorage* which will allow of the tipping buccally of the anchor teeth.

In order to make this anchorage a complete *stationary anchorage* the expansion arch and buccal tube supporting it must be of the nonpivotal variety. The buccal tube may be oblong but preferably oval, while the vertical tube may be oval or half-round, in the use of which the resistance to either a mesio-distal or bucco-lingual force is unyielding, and an absolutely stable anchorage, that is, as far as mechanics can make it, is secured, provided the anchor band is well fitted and cemented in position, and the buccal tube attached as nearly as possible in the horizontal plane.

Examples of the horizontal oblong or oval tubes may be seen in Fig. 21, and in this case the ends of the expansion arch must also be of the oblong or oval form in order to fit the tubes.

The vertical half-round buccal tubes for the labial expansion arch are illustrated in Fig. 22, the end of the .030 inch arch wire being curved upon itself to form a lock when the engaging half-round rod is in its place in the half-round tube (the Angle-Young lock).

The half-round vertical tube and engaging rod is similar for the lingual arch as used by Mershon, although the lock may be constructed of a separate and smaller gauged wire, as shown in Fig. 23.

*Stationary anchorage* is secured in the *secondary anchorage* by the use of round vertical tubes or rectangular brackets attached in the center of incisor, cuspid, or bicuspid bands. In Fig. 24 are illustrated the round vertical tubes on incisor bands, and through the use of which stationary anchorage is secured so that the teeth may be moved bodily, although with some lateral mobility on account of the vertical pivotal anchorage established.



Fig. 24.



Fig. 25.

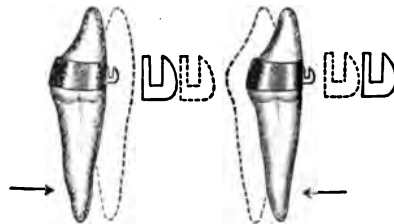


Fig. 26.

In the Angle ribbon arch, *stationary anchorage* is secured in the *primary anchorage* through the curved rectangular horizontal buccal tubes, Fig. 25, and in the *secondary anchorage* by the use of rectangular mortised brackets, as shown in Fig. 26.

*Stationary anchorage* has been described in the light of an absolutely stable resistance, but as has before been intimated, the stability of the most mechanically rigid anchorage is only relative on account of the elastic and unstable nature of the resistance of the vital tissues in which the teeth are embedded.

#### SUMMARY

In the foregoing discussion of the principles of anchorage in modern orthodontia it was found that the *basic principle* of anchorage is founded upon Newton's law that "*action and reaction are equal and opposite*," that *anchorage* was *selected resistance*; that this selection of resistance was better understood if the selected basal resistance was designated as *primary anchorage*, and the points of selected lesser resistance opposed to the basal resistance at the points of de-

livery of the force designated as *secondary anchorage*; that the resistance in anchorage can be built up by mechanical means to the degree necessary for either *inclination* or *bodily movement* of teeth; that *inclination movement* requires the *minimum degree* of resistance only in the *anchor teeth*, while *bodily movement* requires the *maximum degree* of resistance in these teeth; that *inclination movement* calls for a *pivotal attachment*, and *bodily movement* demands a *rigid, nonpivotal attachment*; that the *minimum degree* of resistance in the *primary anchorage* should be made to be *resistance plus*, by mechanical reinforcement, so as to be sufficiently stable to offset an unknown and often powerful resistance in the *secondary anchorage*; that this gauging of resistance values to produce *stability* in the *delivery* of a *force* for tooth movement could be defined as the *principle of fixation*; that, in the *selection* of the various degrees of anchorage resistance from the *minimum* to the *maximum*, the only logical basis for the *classification* of *anchorage* was found; that the classification of anchorage could therefore be made according to the more definite degrees of selected resistance; first, through the form of attachment used, as *pivotal, reenforced, and stationary*; second, from the source of the resistance selected, as *intermaxillary, and occipital cervical*; and third, by the counterbalancing of anchorage known as *reciprocal anchorage*.

This classification is not materially different from those already in use except that it is modified and simplified as much as possible to avoid confusion in the minds of those who have difficulty in understanding the application of the laws of physics and mechanics to orthodontia.

One's conception of anchorage in orthodontia must needs have changed in conformity with the radical changes in methods of treatment due to changes in the theory of the physiology of tooth movement and consequent modifications in the application of force to the teeth, and it has been my purpose, insofar as it has been possible in a limited discussion of the subject, to analyze and interpret some of the basic principles of anchorage in this paper, by such description, definition, and illustration as would enable one to see these principles in their proper perspective and understand their relative importance in the study of the mechanics of modern orthodontia, rather than to designate the choice of any of the appliances shown for orthodontic treatment.

#### DISCUSSION

*Dr. Martin Dewey, Chicago, Ill.*—In opening the discussion on Dr. Pullen's paper I wish to say that anchorage is one of the most fundamental principles, and one of the most important things, in the practice of orthodontia.

In the first place, Dr. Pullen has given us a classification of anchorage in which he has attempted to simplify to a great extent in order to avoid complexities, but you can carry simplification to such an extent as to lose by it, and it is much better to have a thing a little more complex and have it complete.

In classifying anchorage we have to base the classification upon two things. First, the sources from which we obtain resistance, and second, how we obtain that resistance.

Dr. Pullen spoke of intermaxillary, occipital and cervical anchorage which forms can be better classified in this way: First, as regards sources, we divide the sources into extra-oral and intra-oral, the extra-oral would be known as anchorage obtained outside the oral cavity. In that group we have occipital and cervical and facial anchorage. Intra-oral is

intramaxillary and intermaxillary. In intramaxillary anchorage the resistance is in the same arch as the malposed tooth. In intermaxillary anchorage the teeth you wish to move are in the opposite arch from the anchorage.

As regards the application of anchorage, Dr. Pullen describes pivotal anchorage and stationary anchorage. I am not ready at the present time to say that pivotal anchorage is superior to simple anchorage. In using either term, simple or pivotal anchorage, that style of anchorage depends upon anatomic conditions. It is the one form of anchorage where you construct the appliance without any view toward increasing resistance. It is an anatomic resistance entirely.

In stationary anchorage you so construct and make your appliance that you increase the resistance. Stationary anchorage may be defined as that form in which the appliance is so constructed and attached that the anchored teeth must move bodily through the alveolar process. Pivotal anchorage is an anatomic matter, and stationary anchorage is anatomic plus mechanical.

I agree with the essayist in regard to the mode of analyzing appliances for cases from the standpoint of anchorage. If you analyze a lot of the appliances that have been placed on the market and recommended from the standpoint of physical requirements and anchorage, as well as mechanics, you would not use them. According to the advertisements that appear in the dental journals, somebody tells you the appliance you ought to use and how to use it before analyzing it. If you were to analyze some of these appliances you certainly would not use them.

In the definition which I gave of stationary anchorage you have to distinguish between stationary anchorage and stationary attachment, or stationary anchorage and rigid attachment, because your anchorage is a resistance to overcome the applied force and the attachment holds the appliance to the anchored tooth when we use a vertical tube and the vertical end of the alignment wire going into the tube. Mesio-distally you have tipping of the molar so far as anchorage is concerned; if you use a small gauge alignment wire or wire with a loop, and have only stationary attachment, because the alignment wire is so weak that the molar will tip on account of the appliance not being rigid enough. In stationary anchorage you go further than attachment to the molar tooth and construct the appliance with enough rigidity so that it will not spring and prevent the molar from tipping. If you exert force on the anterior segment of a light gauge alignment wire, even if you have a vertical tube preventing mesio-distal tipping of the molar, instead of having stationary anchorage you have only stationary attachment, and the tooth tips. I have seen several undesirable and unsatisfactory results from this. Men think they have stationary anchorage because they have stationary attachment on the molar, and I have seen these molars tip forward and backward because the appliance was not made rigid enough to follow out the principles of stationary anchorage.

The same is true with half-round tube and half-round spur going into the tube vertically and making stationary attachment, which tends to discourage the movement of the molar in any direction except in a bodily manner, but with a light wire and loop the wire becomes very elastic and you lose the stationary anchorage and have only stationary attachment because the molar can tip owing to the fact that the alignment wire can spring.

After the pin and tube appliance had been used probably a year, we found several articles in dental journals where the users were cautioning men against displacement of the anchored tooth. The anchored tooth became displaced because they had used a rigid attachment, which did not make a stationary anchorage. There was so much resistance offered by the malposed teeth that the molar would tip because the alignment wire was not rigid enough to supply the rigidity in the appliance.

One disadvantage of any appliance in which you have finger springs and everything combined in one appliance is that you have so much spring in the small gauge wire that when you adjust it you do not know where your primary anchorage or resistance is. The question simply resolves itself into an anatomic proposition, namely that a tooth that has the least resistance will move first. That may be a molar or something else.

Going again into the question of terminology, we would define anchorage as resistance to overcome an applied force. I do not know where I got that definition. Anchorage is

not a force but a resistance, and as a result of this force which is overcome by the resistance, we aim to achieve some particular object. The object we move, so this force to my mind is not applied to a secondary anchorage. In other words, Dr. Pullen has mentioned primary anchorage, and secondary anchorage. The force is exerted on the resistance and the anchorage must overcome this force. So I think that calling the moving object a secondary anchorage is not mechanically correct.

These terms are interesting when you come to reciprocal anchorage which is to my mind a sort of mechanical misnomer, because in reciprocal anchorage one of the malposed teeth is pitted against the other. The manner in which we are using the term reciprocal anchorage is mechanically incorrect, but as regards the condition which we have become accustomed to consider, I do not know what else to suggest. The term of calling it primary anchorage and secondary anchorage is so mechanically incorrect that it would be a mistaken idea to adopt it.

Dr. Pullen has called our attention to the fact that anchorage may vary. You may have an attachment on the incisors which becomes an anchorage appliance to move the molars.

In these cases of high labial arch finger and springs as used by Dr. Lourie, his idea has changed some since he first brought forward this appliance, and I will show you some of the later uses of it. Of course, one important thing is that this alignment wire is heavy enough to absorb the force exerted by this finger spring without distorting the alignment wire and changing the conditions in the tube. You adjust these finger springs and the main part of the appliance absorbs the force, and no reaction is carried over to the approximating tooth but eventually as this thing goes on your point of resistance is only in the molars. To overcome the tendency towards bucco-lingual displacement as a result of the slight spring in this wire, we now in practically all cases (I know I do) stabilize these molars. I may use the lingual appliance for the sole purpose of increasing the resistance.

*Dr. Milo Hellman, New York City.*—I wish to make a few remarks with reference to some of the more fundamental principles on this subject.

Since Newton enunciated the law of action and reaction (1687), it is so long that one might be led to believe that there has been no progress made in physics during all these years. Newton said: "To every action there is always opposed an equal reaction; or the mutual actions of two bodies upon each other are always equal, and directed to contrary parts." Its modern expression is that action and reaction are equal but in opposite directions.

Recently one of the greatest physicists in this country contributed an addition to this law, and I think it would be well for all who are dealing with physical principles to know it. Professor M. I. Pupin of Columbia University, who perfected the coil by which it was possible to extend direct telephone lines between New York and San Francisco, has made an addition to Newton's law. He shows that the law bearing on action and reaction, is also of great significance in its application in *interaction*. If we ponder sufficiently on this matter we may have a clear idea of what really action and reaction mean. We did not, hitherto, realize that there is something in between action and reaction. The law as it now stands is equally applicable in biology, chemistry and in physics. Thus, says Professor Osborn, "*Actions and reactions* refer chiefly to what is going on between the parts of the organism in chemical or physical contact, and are subject to the two dynamical principles referred to above. *Interactions*, on the other hand, refer to what is going on between material parts which are connected with each other by other parts, and can not be analyzed at all by the two great dynamical principles alone without a knowledge of the structure which connects the interacting parts. For example, in interaction between distant bodies the cause may be very feeble, yet the potential or stored energy which may be liberated at a distant point may be tremendous. Actions and reactions are chiefly simultaneous, whereas interaction connects actions and reactions which are not simultaneous; to use a simple illustration: when one pulls at the reins the horse feels it a little later than the moment at which the reins are pulled—there is interaction between the hand and the horse's mouth, the reins being the interacting part. An interacting nerve impulse starting from a microscopic cell in the brain may give rise to a powerful muscular action and reaction at some distant point. An inter-

acting enzyme, hormone, or other chemical messenger circulating in the blood may profoundly modify the growth of a great organism."

Likewise in orthodontia, we have action and reaction between the influence of the appliances and the response in the movement of the teeth, but this occurs through the *interactive* capacity of the cells constituting the tissues surrounding the teeth.

I do not mean to criticize in any way the remarks made by Dr. Pullen. I think they have been very clearly brought out. I rose particularly to call your attention to the idea involved in *interaction*, and indicate that physics has not remained exactly where Newton left it, for by this modification his third dynamic law is today applicable not only in a Newtonian sense alone but also in a more general sense including biological phenomena.

*Dr. F. C. Rodgers, St. Louis, Mo.*—I listened to Dr. Pullen's paper with considerable interest because of his presentation of a simplified classification of "the forces of anchorage."

The present classification is complicated and unusually hard for students to understand, and changes along the line of simplification are urgently needed, and the ideas of the essayist seem to be in that direction.

*Dr. Pullen (closing).*—I am very much pleased to have had Dr. Dewey discuss this subject, because when we take up a matter like this it shows how two men studying the same subject will look at it from different angles.

In the beginning of my paper I stated distinctly that stability of force or resistance in the mouth is in the relative only and not absolute, and as long as it is so we can not discuss it in the absolute except theoretically.

As regards the designation, and not definition, of secondary anchorage, in attempting to analyze the selected points of greater and lesser resistance and making it the basis of my study, I tried to designate the points of lesser resistance and in that way handle the matter. We have the points of greater resistance in the basal or molar anchorage as a rule. When it came to naming the points of lesser resistance which had never been named or designated, except to designate them as points of lesser resistance, I named them secondary anchorage because they represented a resistance of lesser degree than in the primary anchorage. Perhaps some of you, when you read this paper and look at the illustrations, may appreciate these points better. It has been a matter of a great deal of study, and I have not been able to analyze it in any other way. The paper is an analysis of anchorage principles in modern appliances, and not intended to point out any particular appliance, but rather to analyze the anchorage of many different appliances and adapt new terms which seemed needful on account of the absence of proper terminology to designate the relations of force and resistance in the application of modern appliances. I am sure, you have been taught, in your school exactly what appliances are best, and what are the worst appliances, and are able from a comparison to form the basis of good judgment in the selection and use of appliances which is one object of this meeting today.

I have been working analytically on this subject for twenty years and am still improving my judgment along these lines, making an attempt to analyze all of the appliances I use, and if an appliance is deficient in a certain point, correcting it. In this analysis, as I told you, I define *anchorage* as *selected resistance*, referring especially to the teeth and later to building up the selected resistance at the basal anchorage by the method of attachment, and for secondary anchorage, using less resistance rather than in the primary or basal anchorage.

Dr. Dewey said that the classification of anchorage into extramaxillary, intramaxillary and intermaxillary is an advantage. Personally, I can not see that it is. I have tried to simplify anchorage for teaching purposes, and I have eliminated every term that I could. I think you will find, if you will go over my paper with this idea in mind, I have simplified rather than elaborated the classification. Dr. Dewey says we may simplify a thing too much and thereby leave out some of the details worth mentioning. That is undoubtedly true, but why doubly classify in the use of such terms as extramaxillary, as for example, occipital anchorage is extramaxillary, but that the location of this anchorage is outside of the mouth is perfectly obvious without giving it any extra designation such as extramaxillary in the Dewey classification.

I am conducting no brief for the pin and tube appliance or the ribbon arch appliance, but their analysis is important from the standpoint of anchorage.

Dr. Dewey brought out a point in relation to the use of the pin and tube appliance where we can get simple expansion of the arch, or change the primary anchorage to the anterior teeth and move the molar tooth. You can not tell in these pin and tube attachments how much resistance you have in the secondary anchorage. The same is true with the ribbon arch. There you have interaction as Dr. Hellman so well brought out in his discussion. It is a splendid point to remember in studying the mechanics of orthodontic appliances.

With reference to the use of loops I regard them as dangerous things if not properly used. We have used loops in appliances rather promiscuously for a time, but now we only use them in a few cases. They have their advantage if used rightly. Some loops are used in connection with appliances when they ought not to be. I do not think a small loop in an appliance that has never been used destroys the firmness of the arch to any appreciable extent or causes an interaction of the forces or a change in the resistance, but I do admit that a wrong bending of the loop is immediately liable to change the resistance or tip the anchored tooth.

As to the cemented band in relation to the crib or Jackson appliance, cemented bands hold other appliances so that there is no play at all. With a full crib appliance there is a certain amount of play, and if a cemented band is used as a basal attachment of the crib with lugs for it to be attached to, it becomes in effect a fixed appliance through the locking device thus made.

## THE INTERRELATION BETWEEN ORTHODONTIC MALFORMATIONS AND DISEASES OF THE NOSE AND THROAT\*

BY GEO. C. DITTMANN, M.D., ST. PAUL, MINN.

**T**HAT malformations of the dental arches and the maxillae are a great etiologic factor in producing many nose and throat affections may be realized by a review of the closely correlated anatomy of the bones forming the face.

To better understand this orthodontic interrelationship a brief embryologic survey is necessary. The evolution of the face depends largely upon the parts concerned in the formation of the mouth and nose. The first step in the differentiation of the face is the formation of the oral plate which makes its appearance on the twelfth day, later this becomes the mouth. At the third week the first and second visceral arches appear, the first arch divides into the mandibular arch and the maxillary process, the second arch springs from the mandibular arch; as these processes grow toward the median line the maxillary process becomes the upper jaw and the mandibular process the lower jaw. At the second month a groove makes its appearance on the frontal protuberance and on each side of this there is formed two nasal processes, the outer pair becomes the outer wall of the nose and the inner pair the septum, as these processes grow downward the union of the two upper portions of the mandibular arch forms the floor of the nose.

By the second month of intrauterine life the septum becomes cartilaginous and by the third month ossification begins in the vomer, into the groove of the vomer the perpendicular plate of the ethmoid fits anteriorly, the rostrum of the sphenoid unites above and the nasal crest of the superior maxillary and palate bones unite below.

At birth the ethmoid part which goes to make up the nasal space is higher than the maxillary portion but it becomes of equal dimensions with age, this increase is due to the descent of the hard palate. As the teeth erupt the nares develop, the superior maxillae enlarge and the antrum of Highmore forms, gradually increasing in size; with enlargement of the nasal chambers and formation of the alveolar process development is completed.

It will be noted that the septum is the last of the facial bones to ossify, the fact that ossification begins posteriorly explains the rarity of deformities in this part of the bone.

Thus the nasal chamber depends wholly upon the proper growth of these processes and the adjoining parts and any pathologic condition or malformation tends to affect either by extension or anatomical conformation the sinuses or orbital cavities with subsequent effect upon the ears interrelated as they are with these parts.

In the examination of the nares a deflected septum will be noted, but often if the oral vault is examined it will be found highly arched and the alveolar processes close together.

\*Read at Joint Meeting of Ramsey County Medical Society and Ramsey County Dental Society, Sept. 30, 1918. Reprinted from *Minnesota Medicine*, August, 1919, ii, No. 8.



I have often noted that when doing the submucous operation for deflected septum where the maxillary ridge is thickened and broad there is usually associated with the condition a high arched vault and it must be further remarked that these are the most difficult bony ridges to remove, considerable hemorrhage takes place and when a chisel is used it may be broken in the attempt to level the ridge.

A high arched vault with narrow alveolar processes must tend to so crowd the turbinate bodies and septum together that the respiratory space within the nose becomes greatly decreased which in turn causes mouth breathing and its subsequent results—dry pharynx, enlarged tonsils, adenoids and fetid breath.

It is stated that tonsils and adenoids are the most common cause for mouth breathing in the young, but is it not possible, because of anatomic nasal defects that the enlargement of these tissues might be due to an increased hyperemia mainly as a result of the orthodontic anomaly? What effect treatment of the dental arches has upon the nasal spaces and septum can be appreciated by the joint observation of orthodontist and rhinologist of these cases.

Trendelenburg states that a persistent high arch of the hard palate is the cause of a deflected septum. Ballenger concluded that it is due to incoordination in the development of the bones of the face, this is a fair conclusion when it is realized that the most important area within the nose and known as the viscous area is but one inch in diameter and any obstruction to this region might cause an infection of the nasal sinuses and because of their close anatomical relationship would produce an intrusion upon or actual rupture into the orbital cavity, although more often monocular, both eyes may be affected.

Ocular complications are more frequent in chronic than acute sinus infections, perhaps the most misleading ocular complaint resulting from sinus involvement is asthenopia or an inability to use the eyes for near work for any length of time.

As the sinuses under normal conditions are designed to contain air, any secretion of whatsoever nature remaining for any length of time is pathologic and the importance of early and free drainage should be recognized.

The throat is primarily affected by attempting to clear it of the increased secretion and mucus, dropping from the posterior nares.

From a neurologic view directly as a result of nasal obstruction or malformation the trigeminus that great sensory nerve of the head with its vast number of distributing branches may be directly affected through reflex conditions.

How best to treat these conditions. In children the tonsils and adenoids if enlarged should be removed at an early date, any malformation of the alveolar arches or teeth should be taken care of by the orthodontist; the proper time is during the development of the bony structures and the teeth, since this period extends over several years the greatest importance should be placed on proper occlusion best obtained and constructed at this stage of life.

It can not be advisable to perform a submucous resection of the septum too early in life or remove enlarged turbinate bodies; it is surprising how rapidly the turbinate bodies will shrink down to normal after removal of the tonsils and adenoids.

With adults who have gone through life with high arched palate and contracted dental arches, treatment is still a matter for discussion. L. W. Dean in the *Journal of the American Medical Association*, Nov. 26, 1910, reports a case in which nasal breathing was impossible but by widening of the palatal arch the patient became a nasal breather; as regards the narrow chambers with deflected septum, enlarged turbinates or polypi secondary to sinus infection I believe it has been definitely settled that these conditions should be corrected by operation. Perhaps no operation produces such striking results as the submucous operation for the correction of septal deformities where there has been a narrowed nasal chamber with sinus infection and improper aeration of the middle ear, the technic has been universally adopted.

#### CONCLUSIONS

1. This is an era which must recognize dentistry as an aid to medicine and vice versa.
2. This is a subject which closely associates the orthodontist and rhinologist and for best results in the young a cooperation of the two specialties is imperative.
3. Nasal and throat operations in conjunction with orthodontic correction often give best results to patient.
4. Orthodontic deformities and respiratory function are correlated.

## DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

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### THE COMBINED OPERATION FOR PERIAPICAL AND PERIDONTAL INFECTION; THE REASON FOR THE AUTHOR'S TECHNIC

BY DR. ARTHUR ZENTLER, NEW YORK CITY, N. Y.

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AS AN introduction it may be well to explain that the term "periapical infection" will be used to indicate such conditions which through clinical and roentgenographic examination disclose a pathologic involvement necessitating for rational treatment an apicoectomy followed by thorough curettage of the apical area. The term "peridental infection" will be used to indicate such conditions which through the same diagnostic means disclose an absence of investing tissue and a presence of suppurating subgingival pockets starting at the cervical margin, necessitating for rational treatment a thorough removal of existing irritants and thorough curettage of all the soft and hard underlying involved tissues.

Teeth which through disease or other causes have become devitalized and their periapical region become infected, often have also suffered from loss of investing tissue around a smaller or larger surface of their roots, starting at the cervical margin, suppurative gingivitis (pyorrhea) being present. Such teeth may be said to be affected by "periapical and peridental infection."

In such cases, unless the involved tooth or teeth are removed, it is evident that in order that they be made safe so that their retention may not constitute a danger to the general health, there is little sense in performing an apicoectomy and curettage of the periapical area, unless the peridental infection is also thoroughly eliminated. To attempt this by making any of the adopted and up to the present time described types of incisions, means certain failure to reach

the affected parts originating at the cervical margin, and the further from the apex and therefore nearer to the cervix the infection is located, the more difficult will it be to obtain a satisfactory result with the presently practiced methods of entering the infected areas. In cases where healthy alveolar bone intervenes

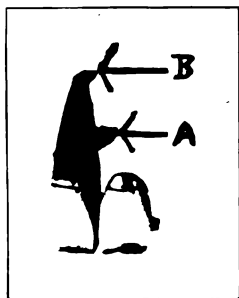


Fig. 1.—Case of Dr. R. W. Wadell of New York City.



Fig. 2.—Roentgenogram of case before extractions. (Same case as in Fig. 1.)

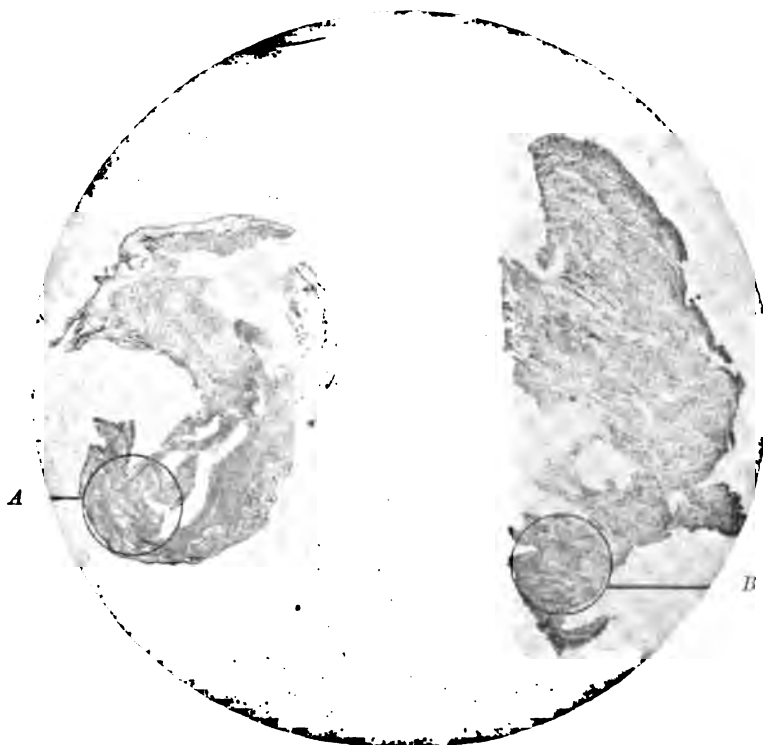


Fig. 3.—A, Section of full growth from Fig. 1, A.; B, Section of full growth from Fig. 1, B.

between the periapical infection and the peridental infection, the operation by means of the now prevailing method of incision will not reach at all the peridental infection.

It is conceded by the best men who have entered infected periapical regions that the only way to completely eradicate such infections, is to remove all that

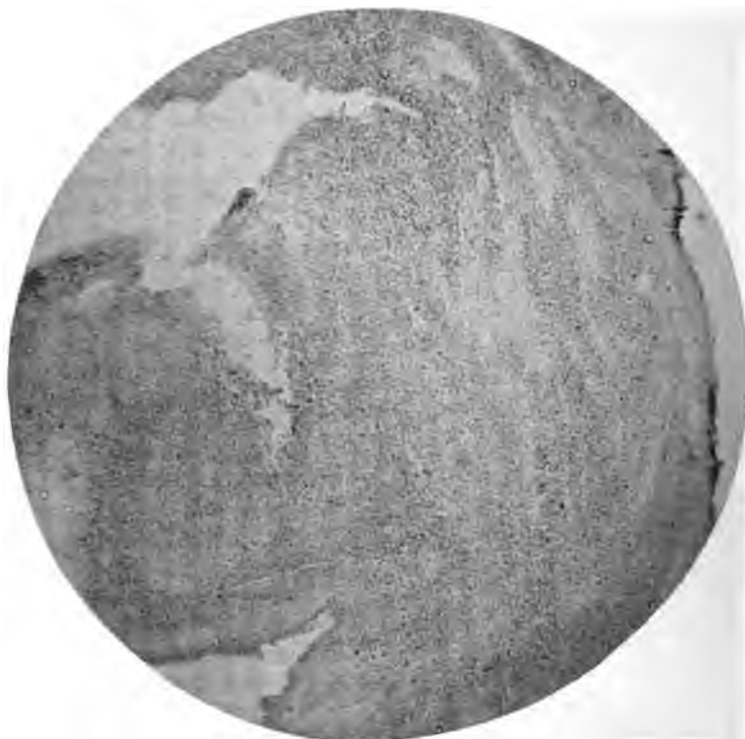


Fig. 4.—Section taken from *A*, Fig. 3, for high magnification. (X 120.)



Fig. 5.—Section taken from *B*, Fig. 3, for high magnification. (X 120.)

portion of the apical end (after the root-canal of the tooth has been very recently correctly filled) which rested in the infected area and to thoroughly curette the parts, so as to leave a fresh surface of healthy bone surrounding the amputated root. If any of the granulomatous tissue found in these regions were allowed to remain behind, or if any of the bone surrounding the infected area were allowed to remain in place without thoroughly curetting the surface coming in contact with the infection, until the familiar feel of healthy bone is noticed, the operation would not be a success and sooner or later periapical reinfection would take place. There is no reason why if reinfection takes place in this region for the above mentioned cause, it should not be the same in other



Fig. 6.—Case of periapical and peridental infection, Fig. 7.—Same as Fig. 6, immediately after combined operation.



Fig. 8.

regions surrounding the teeth and their roots, if a similar condition and cause should prevail.

Where there is periodental infection, there is granulomatous tissue (Fig. 1, *A*) proved by pathologic examination (Fig. 3, *A* and *B*, Fig. 4, Fig. 5) to be of the same character as the granulomatous tissue (Fig. 1, *B*) found in periapical infection.\* Suppurative subgingival pockets forming around the granulomatous tissue, retaining the pyogenic products, progressively reinfect and destroy the alveolar bone surrounding the granulomatous tissue. Undoubtedly, therefore, un-

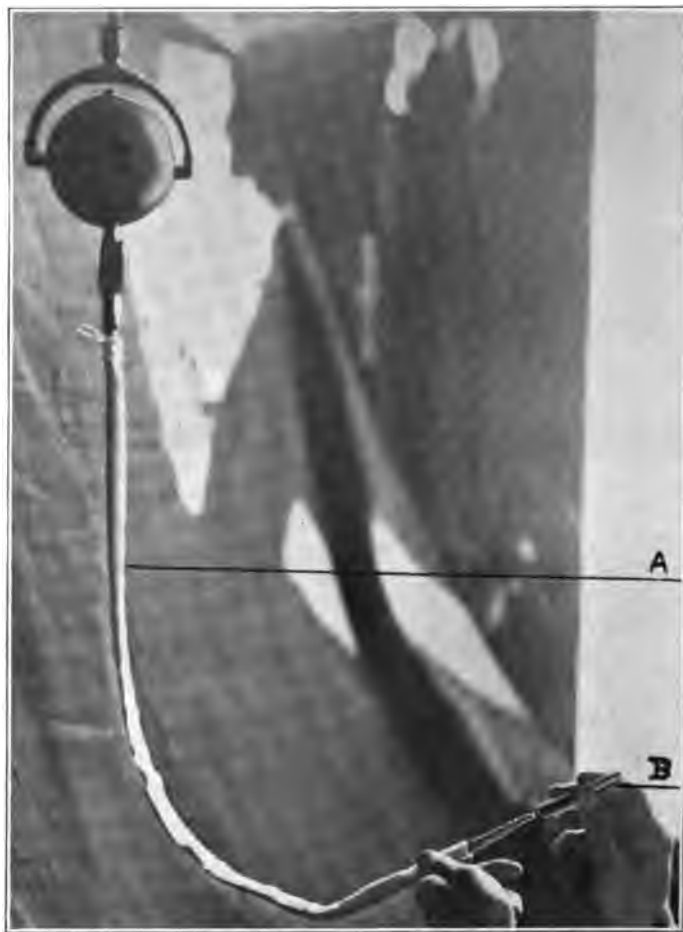


Fig. 9.—*A*, Author's linen sleeve for table; *B*, Dr. Marco's metal slip-on sleeve for handpiece.

less the same principle of thoroughness is exercised in completely removing all the involved soft and hard tissue and unless the subgingival denuded surfaces of the root are thoroughly freed of such irritants as may be present, and curetted, there is nothing to expect but recurrence of the periodental infection.

In order to obtain unobstructed access to both the periapical and periodental infected regions (Fig. 6) at the same time, so as to be able to execute the needed

\*Report of National Pathological Laboratory of tissue from Fig. 1, *A* and *B*: "Both pieces same type of tissue and show solid infiltration with lymphoid cells and polymorphonuclear leucocytes."

steps for a thorough combined operation (Fig. 7) for peridental and periapical infection, after preparing the patient as for all oral surgical operations under novocain-suprarenin conductive anesthesia, two vertical parallel incisions are made either side of the tooth or teeth involved, starting at the cervical free border of the gum and carrying them *beyond* the apical region. A periosteal flap is lifted, retracted and held in place by the assistant (Fig. 8).

The periapical area of infection is easily reached, if the overlying alveolar bone is destroyed by disease, without the use of the chisel and mallet. If the overlying infected area is covered by healthy hard bone, this is chiseled away and after the apical end of the root is freed of surrounding bone, it is removed with a chisel and mallet if the tooth is fairly solid in its alveolus. If the tooth is loose and the looser the tooth, the more the use of the surgical burr in the en-



Fig. 10.—Author's recently improved set.

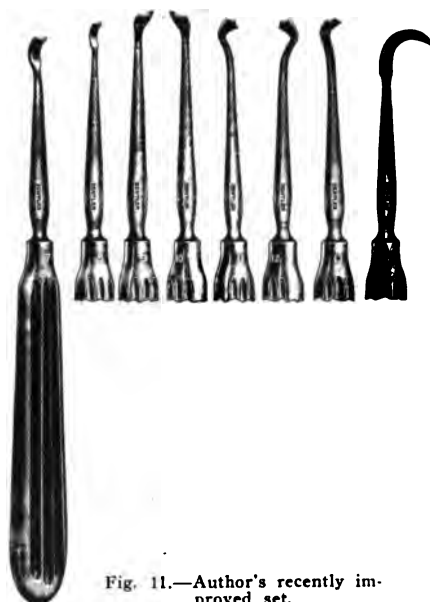


Fig. 11.—Author's recently improved set.

gine is preferred to the chisel for the severing of the apex. Whenever an engine is used for surgical operations in the mouth, the cable engine is advantageous because of the possibility of covering the cable from one end to the other with a sterile linen sleeve (Fig. 9, *A*) designed for this purpose and being one inch in diameter and about 33 to 34 inches in length. The handpiece being covered with a metal slip-on sleeve (Fig. 9, *B*), designed by Dr. Marco, which can be easily sterilized through boiling.

When the chisel and mallet are used for the operation, a round wide-bladed surgical burr may be used to smoothen the amputated root-end as well as any sharp edges of the surrounding bone. A normal saline solution is used to wash away any shavings resulting from the use of the burr.

When assurance is had that the periapical infection is thoroughly accounted for, a sterile small gauze sponge is placed lightly in the periapical space and attention is directed to the peridental infection.



The technic of operating for this was formerly described and published\* in detail, and only the more pertinent parts of it are here repeated: The diseased part being well exposed, with suitably, specially designed knives and cu-



Fig. 12.

rettes, the shapes of which have recently been somewhat modified (Figs. 10 and 11), all the inflamed, infected, granulomatous tissue found between and sur-

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\*Journ. Am. Med. Assn., Nov. 9, 1918, p. 1530; also Dental Items of Interest, March, 1919, p. 175.

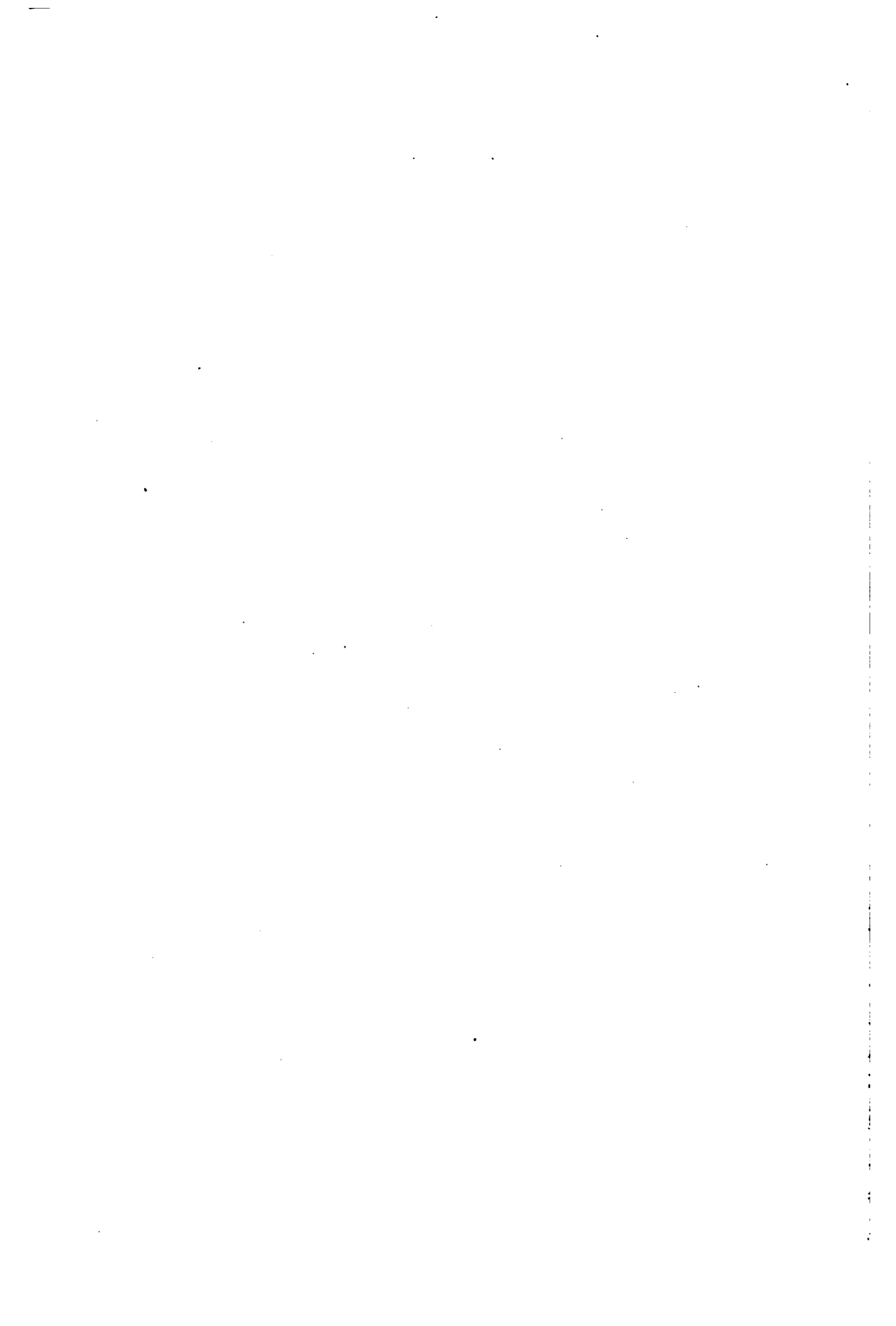




PLATE I

Same case as Fig. 15. Reproduced from slide obtained by Lumiere process  
in 1917 shortly before operating as described in Fig. 15.

rounding the roots of the teeth is removed. Next, with delicate chisels and mallet, the alveolar plate is chiseled away from around the denuded portions of the roots, so as to insure the removal of any and all infected bone covering the roots, which are then well curetted. The rough edges of the remaining alveolar bone covering the roots are well smoothed so as to form an even surface with them.

It will be often found upon the inner portion of the flap, as well as in the periapical infected region, if the bone has been destroyed by disease, as in the



Fig. 13.



Fig. 14.—Same case as Fig. 13 seven months after root canal filling and combined operation.



Fig. 15.—Photographed May, 1919. Case operated by lifting flap over entire upper anterior region, in 1917; lower anterior region operated by the modified excision method (see page 5, *Dental Items of Interest*, March, 1919).

peridental infected region that portions of pathological (granulomatous) tissue adhere to the subperiosteal surface of the flap when this is lifted. All such pathological tissue whether in the portion overlying the periapical region or

elsewhere on the flap, must be carefully dissected away, leaving no diseased tissue adhering to it before replacing it in position. Before doing this, the gauze sponge placed in the periapical cavity is removed, the entire area operated upon is swabbed with a 50 per cent solution of the official tincture of iodine, and the wound surface freshened up. The flap is finally sutured (Fig. 12). This is followed by the usual instructions to the patient, and postoperative care given any other oral surgical operation.

Wherever the periapical and the periodontal infection are so advanced that they are continued into each other to such an extent that most all of the investing tissue surrounding the apex and other surfaces of the root is lacking (Fig. 13), the combined operation as above described, if at all performed, instead of removing the tooth, may be done only as an experiment.

Such cases were operated by the author, experimentally, and terminated successfully in a sufficient number of cases to make the effort worth while. (Fig. 14).

The complete reattachment of the gingival flap, firmly embracing the root of the tooth at such portions (cervix or higher) where it was replaced in cases operated (Fig. 15 and Plate I) fully disposes of probably the only objection which may be raised (by such who have not seen the results of the operation), namely, the fear that severing the attachment of the gingiva at its free border, in such parts where disease has not already accomplished it, may mean a permanent injury to the part.

If the operation is performed with the care and thoroughness essential to all surgical operations upon infected areas, there will be, in time, such perfect gingival reattachment, that even the finest probe can not be passed.

# DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

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It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

## DENTAL RADIOLOGY AND OBSCURE INFECTIONS\*

BY FRED S. O'HARA, M.D., LIEUT.-COL., M. R. C.  
SPRINGFIELD, ILLINOIS

OF exceeding importance was the position of the liaison-officer "over there." Over here, the connecting link between the physician and the dentist is analogous to that of the officer just mentioned and is filled only by the rentgenologist.

In those good old days (now visible only through the dust that we have raised by our high-powered thinking-apparatus as it sped down the highway of years), "rheumatiz" and "neuralgy" were carefully and patiently treated, through years of time, with powder, pill, and potion. "Yarbs" were brewed *ad nauseam*; porous-plaster emporiums worked overtime, to fill the demand; and wintergreen-trees sobbed away their innocent lives in the knowledge that they would be early called upon to fill the emptiness in the gaultheria-receptacles.

The doctor that could introduce the greatest number of ingredients in one bottleful of dope was the commander in the antirheumatic phalanx, and all sought that famous prescription wherein could be tasted everything from stewed onions to broiled rubber sheeting. Children had seven kinds of hell whipped out of them to cure the "growing-pains," under the impression, evidently, that counter-irritation was worth its weight in porter-house steaks.

### A PROPHECY OF A NEW ORDER

Strange to relate, when grandma bade farewell to the last of her snaggy teeth and assumed the role of chief engineer to a full complement of artificial teeth, her "rheumatiz" left her, she improved in condition; in fact, gained in weight and strength to such extent that she once more could bring in the coal and the kindling.

\*Reprinted with additions from the Am. Jour. of Clin. Med., August, 1919, xxvi, No. 8.

When the maid of all work visited the dentist because of toothache, she came home spitting blood, but, that was all. One by one, the decayed teeth left their moorings, and her smile became that of the family-watchdog through a picket fence. Later on, she made the final visit to the dentist and shed the remainder of her grinders; appearing soon after with a temporary plate which, in turn (after the bone had filled in), yielded place to a permanent artificial denture. Then all her troubles were over, unless she married the town-sot or tied up with a four-plus Wassermann clad in trousers or a walking representative of Neisser's favorite plaything.



Fig. 1.—This "nervous" woman has an abscess in a tooth with a gold filling. Nerve died as a result to the "pecking" of the gold foil into the tooth.



Fig. 2.—A not unusual aftermath to "crowns."



Fig. 3.—From the same patient as Fig. 2.



Fig. 4.—Rheumatism.

This little attempt at levity brings us to facts, hard, iron facts: Each year brings a new fad in medicine (and dentistry). Sometimes a thing to be promptly discarded, after having been tried in the balance, and at other times a something that shows a rift in the clouds that obscure the *ultima Thule* of medical and dental ambition.

My earliest recollection of dentistry was the rule to extract any tooth that ached. My father was an excellent dentist, yet, despite my early training along dental lines, I hopped the dividing fence and cast my lot with the medical fraternity; "not, that I loved Cæsar less, but, that I loved Rome more." I well remember the lame, the halt, and the (almost) blind coming into my father's office and departing, minus a multitude of snags and roots. I have seen the same patients come back for artificial teeth, improved in appearance and having gained in weight, despite the fact that, during the interim, they had been upon a soft diet that could be disposed of by unarmed gums. And, with subsequent mastery of the art of mastication by means of artificial teeth, said patients bloomed afresh into ruddy health. Why?

#### ABSCESSED TEETH, AND CHRONIC AILMENTS

Far too lengthy for the contribution that I purpose to limit to less than a folio would be the discussion of body-infections from decayed (abscessed) teeth.



Fig. 5.—Note the anterior "abutment" for the bridge. Probably one hundred dollars wasted besides the danger from absorption.



Fig. 6.—Same as Fig. 5.



Fig. 7.—This bicuspid shows no cavity nor decay. Yet it is abscessed and its possessor was "rheumatic."



Fig. 8.—He "kicked" because the dentist would not work upon the teeth without an x-film. Note the enormous abscess.

Consider the decay that causes an inflamed and, later, a dead and decaying nerve; and, owing to the plug of foodstuffs that effectually blocks all drainage through the crown of the tooth, the pus finds outlet through the apex of the root of the tooth, and there, in the spongy bone, it thrives and founds a numberless family, which may show a danger-signal by a "gum-boil," but, not infrequently, exhibits



itself in the form of arthritis, appendicitis, endo- or pericarditis, cholecystitis and many other forms of "itis." That such things have happened even the most conservative will admit.

And now comes the danger line. Let him that is without error among you cast the first stone. It is here that sages will disagree. Shall the dentist endeavor to sterilize the root and save the tooth or, should the tooth be extracted at once? *Quien Sabe?*

So, we must endeavor to penetrate further into the mysteries of the apex and the apical abscess. The radical dentist, by means of microscope slides, shows that the abscessed cavity never heals completely; that a tooth in which the nerves are dead is a foreign body in the alveoli and should be removed, as becomes a foreign body. The ultraconservative dentist assures us that "thousands of these teeth have given no trouble and that crown- and bridge-work are far better than clacking porcelain."

But, while I have your undivided attention, I will state that even the ultra-conservative dentist, when ordering dental x-ray work, invariably (unless all



Fig. 9.—Diagnosed MUMPS but swelling persisted. Patient came to me for x-ray of HEAD. I first examined teeth and found the trouble without raying skull.



Fig. 10.—Rheumatism.

teeth are to be rayed) calls attention to all crowns and bridge abutments, and desires that they be given careful attention. And there begin the troubles of the rentgen-ray specialist.

#### UNCERTAINTIES OF INTERPRETATION OF SKIAGRAMS

How can I prove that there is an active abscess under a given tooth? The answer is delightfully short. "I CAN'T"—that is, without the assistance of a few questions and some common sense. Unfortunately, the necromancer that works the jigger that makes the x-rays come out of the little opening is supposed to be many things that he *is NOT*. Among these things, are the roles of fortune-teller and prophet of the future. *But*—given a case wherein a "gum-boil" has caused the patient to seek dental consolation and said dentist sending the subject for a skiagram and then, when the film has been introduced into the mouth, back of the "gum-boil," showing an apical abscess; this, plus a history that the tooth "feels longer than the rest," is a fair indication of active trouble.

Were one of the readers to sit upon a 12-inch high-explosive shell and peck at the percussion-end until the shell exploded, he, too, would be convinced that the shell was active.

A man can ponder at the edge of a shell-hole and say, "A shell exploded there." If grass is growing in the cavity, he can be reasonably sure that the explosion was not a recent one. But in any event, he can not be sure that there are no fragments of shell left buried in the crater. So with the tooth abscess. Maybe it is ancient, perhaps fairly recent, but, we have not the knowledge whether or not the justly famous *Streptococcus viridans* has occupied apartments in the alveoli. Most of the investigations show that Mr. and Mrs. S. Viridans are there and at home all the time.

Hence, we have a camp of physicians and dentists that say: "If it aches, have it out; if it has ached, have it out." And, we can not give a much safer answer.

It were useless for me to describe a rheumatic wrist in full bloom subsiding coincidentally with the removal of an abscessed cuspid tooth. Please, take my word for it. It were supererogation for me to state that, in all the years that I have been radiographing teeth, I never have failed to find apical abscesses in every case of "rheumatism" brought me for skiagrams of the teeth.

Let us agree that far too much is expected immediately after the removal of teeth found guilty. Were the sockets curetted or did the dentist allow the involved area to be sealed in by process of nature? In extreme instances, the deposit of the "deformans" is so great that it never can be wholly resorbed. This is our misfortune rather than our fault. The percentage of recoveries is high, much higher than before the "take the picture of my teeth" became the slogan of our rheumatics.

In these days of progress, when our advance-guards are so close upon the haunches of the enemy that our guards can count the hobnails upon said enemy's shoes, a mistake in diagnosis may be the cause of failure when dental films are called to account. I have seen a neuritis (following the influenza of recent months) so simulating the old and familiar sciatica that the first thought was, to radiograph the teeth of the sufferer. But, when he took them into his hands and passed them to the doctor, with a friendly "Go as far as you like, but, do not break them," the doctor wisely began to search for other possible avenues of infection.

#### ALWAYS HAVE THE TEETH RADIOGRAPHED

It is possible to theorize until the bottomless pit is transformed into a skating-park and yet not reach facts. As I see the rift of light through the clouds it reads like this: "the teeth are responsible for a multitude of ailments. It is never supererogation to have them examined, although, many times, the seat of trouble will be found elsewhere."

Do not expect everything of your dentist. He will help wonderfully; still, he is not infallible. The work of dental radiography is new, so new that we do not fully comprehend everything that we see upon the plates.

In interpreting films, two things are misleading. The anterior palatine canal, if the angle of raying is not perfect, may simulate an abscess under either of the upper central teeth. Also, the shadow of the inferior mental foramen may cause like confusion, by overlying a bicuspid.

Make friends with the rentgenologist, and do not be superior to asking him

for his opinion and interpretation. (Note kindly, that I am not speaking of the mechanical "laboratory-man," who is only a technician and who is without medical education.) The rentgenologist sees hundreds of films where you see one. "Practice makes perfect."

In conclusion, just think back to the days when artificial teeth were the rule, and go over those cases that were rheumatic, and try to recall the condition of the teeth in such cases. Mouths full of snags? Surely! How well you remember the Roquefort-cheese breath and the tongue that required an acid bath to tell whether it was coated or plated. Yet some of the advanced thinkers of those days smelled the mouse that we have visualized, but, most of them thought that the bacteria of decay were ground into the food and hence, affected the digestive organs alone. They did not dream that mastication was pumping a myriad of germs from the apices of the teeth into the blood-stream.

#### EMPIRICISM AHEAD OF SCIENCE

I well remember my father (a dentist), twenty years ago, refusing to install bridgework; offering as his reason the conviction that bridgework was unsanitary, citing his experiences in removing bridges and extracting the "abutments," with a notable improvement in the health of the patients. Bringing the theme down to date, recently, a dentist in discussing the matter with me, remarked: "Your dad was twenty years ahead of his time. How we laughed at his cranky ideas then, but, we know now that he was right."

Readers, most of you will see the disappearance of bridgework and the final obsequies of the porcelain and gold crowns mounted upon dead teeth.

Prophylaxis? Surely! Write this in letters of fire. "DON'T LET YOUR TEETH ACHE." Give the same advice to your patients.

Each day brings me fuller conviction that a new era in dentistry and medicine is at hand. In ten years the extremely delicate art of angling for dead nerves will become about as popular as a case of measles in a baby ward. Those dentists who have bent and broken under the nerve-wrecking strain of root canal work will become relics of the past.

Grandma and mamma, having suffered hundreds of dollars worth of jewelry to be ripped from their mouths, will see to it that the rising generation "have their teeth tended to before they ache," and the world will have advanced another peg toward perfection.

# **ABSTRACT OF CURRENT LITERATURE**

**Covering Such Subjects as**

**ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY**

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

## **The Etiology of Mutism in War-Wounds. A. Chiavaro. *Annali di Odontologia*, 1919, iv, No. 1, p. 11.**

Mutism is sometimes associated with lesions of the maxillary bones, and accordingly acquires an odontological interest. The majority of the cases of mutism published in the course of the war have been defined as cases of psychic hysterical mutism, because the mutism was not apparently associated with any lesion sufficient to explain it. The mode of recovery seems to indicate the hysterical character of the mutism, for after a more or less prolonged period of total silence, the patients usually speak under the influence of a violent emotion, frequently after awakening from chloroform or ether anesthesia given for the performance of some surgical operation. This fact was known long before this war and was mentioned by Hutchinson in 1820 in the report of a clinical case. A few cases of mutism in soldiers with maxillary wounds came under observation in the principal military hospital in Rome, and were at first diagnosed as cases of hysterical mutism. On more careful observation, however, it could be shown that in several of these cases the etiology of the mutism was referable to anatomical lesions, after the cure of which the patients regained the power of speech. A very instructive case of this kind concerned a soldier of 25 years who was wounded by a gunshot projectile, with the entrance orifice in the right zygomatic region and the exit orifice behind the maxillary angle on the left side. In its course the projectile had produced severe lacerations of the palate, and after penetrating into the buccal cavity had knocked out several teeth, it then passed through the left wall of the pharynx, very close to the nerves and blood-vessels, without damaging the carotids. The patient could pronounce only a single sound: Ah! but in spite of all efforts was unable to speak a word. When admitted to the hospital, he was suffering from sinus suppuration of traumatic origin, for which he was operated upon under chloroform anesthesia. He remained voiceless after awakening, but six days later he began to speak and gradually reacquired the normal power of speech. Another soldier, who was admitted with maxillary fracture, suffered besides from hysterical deaf mutism. Three months previously, he had been wounded by a gunshot projectile which entered on the left side of the chin at the level of the buccal angle, corresponding

to the first upper molar; the bullet had pressed through the alveolar portion of the mandible, fracturing three teeth on the left lower side; next, it passed through the floor of the mouth, emerging on the right side of the neck at the anterior border of the sternocleidomastoid, at the level of half the mass of the thyroid. This case had likewise been interpreted as psychic-hysterical deaf mutism, but observation served to show that the deaf mutism was actually due to the above-described lesions which affected the ears, and to the existing paralysis of the right half of the tongue and the floor of the mouth on the same side. As these pathologic conditions improved, the patient began to articulate a few words and later on regained the power of speech.

Mutism can not, of course, be claimed to have only one pathogenesis, whether it manifests itself as the only pathologic expression following a severe nervous shock, or whether it appears as a complication of other lesions. Without denying the possibility of a purely psychic-hysterical form of functional mutism, the author believes that the pathogeneses of many cases of mutism are referable to other causes. A severe nervous shock, and traumatism in other cases, may produce a passive congestion of the vessels which supply the cortical center, consequently determining the functional arrest of this center, which governs the motor function of speech. This functional arrest will subside spontaneously after a short time, unless the cause which has produced it continues to act, which is presumably true in many cases of obstinate mutism. Etherization, which produces in the first place a marked stimulation and considerable hyperemia of the meningeal vessels of the cortical region, and in the second place a decongestion efficiently assists the re-establishment of the normal circulation, thereby favoring the recovery of the psychic-motor function.

**Fistula of the Parotid in War Wounds of the Face and Jaws, with a Note on Radium Treatment.** Percival P. Cole and R. Knox. *The Lancet*, London, 1919, i, p. 971.

Fistula of the parotid gland or its duct is a relatively rare complication of facial wounds. Whereas gland fistulae and incomplete fistulae of the duct when healing is delayed always readily respond to the application of radium on x-rays, complete fistula of the duct is incurable except by operative methods, in the form of seton operations, atrophy operations, and reparative operations. Section operations are usually unsuccessful and are mentioned only to be condemned. Atrophy operations, which aim at inhibiting secretion by cutting off the secretory nerve-impulses to the gland, are likewise undesirable. A reconstructive procedure was adopted by one of the authors (Cole) with very favorable results, in two cases in both of which several previous attempts had been made to reestablish communication with the mouth by seton methods, the only result being to diminish plasticity by the increase of scar tissue, and so add new difficulties to those already existing.

**Technic of Radium Exposures for Parotid Fistula:** The treatment in all the cases dealt with—sixteen in number, was the same, namely, exposures to a penetrating radiation from 200 mg. of radium contained in platinum tubes of a

thickness of about  $\frac{1}{2}$  mm.; in addition, 3 mm. of lead were employed to cut off all or nearly all of the hard beta radiation and allow of the gamma radiation being used. The radium tubes were enclosed in rubber tubing and in addition several layers of lint were used on the skin to cut off any secondary radiations from the metal filters. An exposure of three to four hours was given to each skin area. In one case each area received six hours' exposure. The variation in the time factor was estimated on the condition of the tissue in each case, those with considerable induration of tissue receiving longer exposures than the others. No marked reaction was obtained in any of the cases treated. In a number of patients, x-rays were combined with the radium treatment, small doses being given at short intervals; the x-rays were filtered through 2 mm. of aluminum.

### **Bilateral Temporo-Maxillary Ankylosis Successfully Treated by Operation.**

L. Arago, II Policlinico, 1919, vii, No. 71.

The author describes the technic of his original procedure of simple resection of the ascending ramus and the articulation employed by him in a case of temporo-maxillary ankylosis with complete trismus in a young man of twenty years. The condition had followed an attack of parotid inflammation after small-pox. A horizontal incision is applied along the zygomatic arch, and the bone is then very closely scraped, under detachment of the masseter, thus reliably avoiding the facial nerve, the blood vessels, and Steno's duct. The ascending branch is then divided, tangential to the border of the sigmoid notch; next, the condyle is resected and the coronoid process is turned down with the forceps. In this way a pseudarthrosis is obtained which permits the normal motion of the mouth, and especially a good articulation of the teeth. The operator expresses himself as very well satisfied with the results of this simple operation, which is nonmutilating and can be easily performed under local anesthesia. To circumvent the difficulties resulting from the unequal level of the skin and bone section, an electric drill is utilized. A linear series of orifices is applied and subsequently united with an instrument, so that the ascending branch is promptly divided. From the tenth to fifteenth day following the operation, the supplementary mechanical treatment may be instituted.

### **Report of a Case of Emphysema. L. N. Diaz. The Dental Cosmos, 1919, lxi, No. 8, p. 781.**

The patient was a young man sixteen years of age, with a second right upper bicuspid which had to be devitalized. The usual procedure was followed, i.e., an application of arsenic for removal of the pulp. The canal was found to be quite large, as is usually the case with young persons, the foramen also being found to be above normal size. Just before scaling the canal, as the final step, the operator proceeded to dry out the canal with a hot-air syringe, the air compressor registering fifteen pounds. The operator was so taken up with the operation that he did not see a gradual swelling of the tissues on that side of the face, until the patient called his attention to it. The patient was by this time gesticulat-

ing and giving all signs of a man in distress. The swelling was strictly unilateral, much enlargement showing under the eye and over the whole cheek, giving all indications of being intramuscular rather than subcutaneous. As the air did not appear to escape through the canal, the tooth was sealed with gutta-percha and the patient sent home, the operator reassuring him by stating there was nothing amiss in that peculiar condition, and telling him to return on the following day. When the patient returned the swelling had subsided to a great extent. On the third day everything was found to be normal, whereupon the canal was filled, and up to the present day it has not given sign of any abnormality.

**Fracture of the Mandible in the Vicinity of the Angle. R. V. Hennessy.**  
*The Medical Journal of Australia*, 1919, ii, No. 5, p. 88.

The author was enabled to observe a peculiar case of double fracture of the mandible, the result of traumatism, in a young woman 23 years of age. The skiagrams showed in addition to fracture at the angle of the bone on either side, the presence of an unerupted third molar tooth which on the left side at least was definitely impacted. It was decided that the best way to treat this fracture would be to immobilize the temporomandibular articulations by wiring the teeth of the island fragment of the mandible to those of the maxilla in correct dental occlusion. Angle's heaviest gauge orthodontic wires were used. One wire was passed around one of the bicusps and the canine tooth in both jaws on either side, eight teeth in all being used. The tails of the wires were left long and were intertwined with those of the corresponding teeth of the opposite jaw, thus effecting a permanent fixation of the lower teeth to the upper. The anchorage thus obtained was not sufficiently strong to withstand the strain for longer than one week. Altogether until they were finally removed, the wires were renewed three times, this covered a period of about three weeks. By this time the union had become sufficiently strong to give rigidity to the jaw for movement and mastication. Three months later, when the patient was last seen, there was a firm union on both sides and no callus was perceptible to the examining finger. The facial symmetry was undisturbed. The bite was not exactly the same as before the fracture; there was a very slight inferior protrusion. Nevertheless the patient was able to masticate with ease and the new bite caused little or no inconvenience. During treatment of such cases, the oral hygiene is easy to maintain and a tooth brush with peroxide is used vigorously and frequently. A spray is useful in the early stages.

**Tuberculosis of the Inferior Maxilla. Aimes and Aubanel. *Le Progres Medical*, 1919, xxx, p. 291.**

This bony localization of tuberculosis represents a rare variety of the disease. The lower jaw is not equally susceptible in its entire extent, the alveolar portion and the region of the angle being most frequently affected. A distinc-

tion is therefore made between two anatomical forms, the alveolar and the central, although the latter may also become localized at a distance from its site of election at the angle, involving the ascending ramus, for example. Tuberculosis of the lower jaw is a disease of childhood and youth, affecting both sexes equally and manifesting itself in patients who are already infected and present other tuberculous lesions. The maxillary localization in these cases is secondary, the infection occurring through the blood vessels and lymphatics. In other cases, the involvement of the jaw follows upon a lesion in the vicinity, such as periostitis or ulceration of the gums due to the tubercle bacillus. Finally, tuberculosis may become superadded to a pre-existing nontuberculous inflammation, such as osteomyelitis, gingivitis, or simple periodontitis. Manifest or latent tuberculosis usually exists in all these cases of secondary localization, as in the author's little patient. Primary forms, however, do occur, in which the affection of the maxilla is the first demonstrable manifestation of tuberculosis. The avenue of entrance in these cases is represented by a surface infection of the lung, a skin abrasion, or penetration of the bacillus through the intestinal mucosa. After a latent stage during which the germs travel through the blood vessels or lymphatics, they lodge and manifest themselves at the level of the maxilla, the circulatory system accordingly constituting the route of propagation. As the cause which determines the arrest of the bacillus at this point, traumatism or dental extractions have been held responsible, but the origin usually remains obscure. The first symptom is bony swelling, also involving the soft parts, at the level of the cheek, but usually without a change in color of the tissue surfaces. The swelling in this stage is hard, nonfluctuating, accompanied by a dull pain, spontaneous and on pressure. Gradually the swelling extends, increases in volume, and becomes locally softened. The pain becomes more severe, functional disturbances supervene, and mastication is interfered with; the cervical glands participate in the process, and the resulting adenitis may in its turn lead to suppuration. In the final stage, an abscess forms, fluctuation is established, the superficial tissues ulcerate, and a fistula appears, external and opening on the cheek in case of localization at the level of the internal angle; intra-buccal, when the alveolar margin is affected. The fistula leads either to the bone itself, or to a sequestrum, but this is not invariably the case. The above-described course is slow and requires several months or even years to arrive at its ultimate stage. The process is essentially local, and unless complications occur, the general symptoms remain insignificant, for example a slight rise of temperature at night. The symptomatology of the ordinary type is the same as in all bony tubercloses, but acute forms of osteomyelitic type also occur, with a sudden onset and a rapid course, accompanied by redness and heat of the tissues, and associated with very marked general phenomena, such as a high fever, acute pains, headache, and prostration. Intermediate forms between these two extreme types are sometimes noted, as in a case under the author's personal observation. The patient, a boy eight years of age, presented a large abscess over the lower jaw, on the left cheek, extremely painful and adherent by a broad base to the inferior maxillary angle. Radiography showed a considerable thickening of the entire left lower jaw, with a zone of bony rarefaction; the thickening was especially marked at the horizontal ramus, in the vicinity of the maxillary angle.



**Amputation Neuroma of the Lower Jaw.** F. Bruning. (*Centralblatt für Chirurgie*, 1918, No. 40, p. 713.) *Correspondenz Blatt für Schweizer Aerzte*, 1919, xlix, No. 31, p. 1186.

In a case of extensive shattering of the lower jaw through a gunshot projectile, the cause of the severe pains which persisted for a long time consisted in a typical amputation neuroma of the mandibular nerve. Removal of the neuroma by means of avulsion was followed by complete recovery. Cases have been observed in which the terminal cicatrix presented an enormous number of nerve fibers (nonmedullated) several years after the operation. An extremely profuse regenerative reaction of the nerves may occur even after a very prolonged functional rest of the nervous fragments. In this instance, the ends of the ruptured nerve were well protected by the bony canal, and the gradually extending axis cylinders at first encountered no resistance, until later on they met with scar-tissue, with the result that their growth became intermingled and a neuroma was formed. The patient had lost the entire anterior portion of the lower jaw through the gunshot wound, and at the time of admission to the Military Hospital in Constantinople presented the following picture: The anterior portion of the inferior maxilla was missing on both sides as far as the first molar. The soft parts were for the most part preserved, with considerable cicatricial contractures, whereas the bone was completely lost. Numerous fistulas, discharging pus and mucus, were seen over the two bone-stumps, in the external skin, as well as towards the mouth. Recovery followed after exposure of the bone-stumps and removal of sequestra from both sides. A well marked tenderness of the right bone-stump persisted, the cause of which was not discovered in repeated examinations. The external and internal cicatrices were free from irritation, and no inflammatory manifestations existed in the surroundings. There were no remnants of roots, and no sequestra were revealed by radiography. Under the assumption of periostitis, the treatment consisted of hot compresses from the outside and application of iodine tincture to the surrounding buccal mucosa. Some improvement was obtained, but the severe pains still persisted and required treatment. Keeping in mind the possibility of adhesions of the mandibular nerve to the cicatrix, the author did not feel justified in excluding the presence of a causative sequester, not shown in the radiogram. The maxillary stump was accordingly exposed in another operation. Neither inflammatory phenomena nor sequestra were found, but the mandibular nerve presented a typical small amputation neuroma. The nerve projected only slightly from its bone-channel and terminated in a spherical dilatation nearly the size of a pea. Only slight adhesions with the cicatrix were present. The neuroma had developed in the bony canal which extended for a short distance as a partial canal minus the external wall. The nerve was removed by avulsion, and the patient made a good recovery.

**Osteomyelitis of the Mandible Due to Apical Dental Necrosis.** B. De Vecchis. *La Riforma Medica*, xxxv, No. 22, p. 439.

Attention is called to this pathologic manifestation, not on account of the difficulty of the diagnosis and differential diagnosis, but on account of the im-

portance of its origin, on which intelligent and helpful treatment may be based. Two typical cases of mandibular osteomyelitis recently came under the author's observation, which, although of similar onset, differed in their course, their clinical features, and also as to the prognosis. The first patient, a strong and healthy soldier, 34 years of age, was kicked by a horse in the region of the chin and suffered deep lesions down to the bony layer, the symptoms gradually subsiding. Examination three months later showed the existence of some swelling, especially in the central portion of the chin, and three small fistular openings with a cicatrized floor. On deep palpation, which was extremely painful, a few drops of creamy yellow pus escaped from the fistulous tracts, these converged towards a point near the median incisors, where a small sequestrum was encountered. Radiography showed small areas of absorption about the genial process and some tracts of hyperostosis and inflammatory thickening of the bone. The dental apex of the right median incisor seemed to be entirely absorbed. The diagnosis was subacute focal osteomyelitis with fistula-formation. The prognosis was anatomic and functional cure within one month. The treatment was operative and consisted in extraction of the incisor, scraping of the alveolar floor, and thorough irrigation with hypochlorite solution. The mandibular swelling subsided in a few days, and the fistular tracts which were syringed out daily with the above-mentioned solution, closed about the fifteenth day. The patient left the hospital well, one month after admission.

The second observation concerned a man of 28 years, in bad condition, and suffering from chronic malaria. A swelling of the right half of the face had developed without an apparent cause. A complete examination of the buccal cavity was not possible, as the patient suffered from contraction of the jaws. Two lower molars on the right side were seen to be carious, and pressure on these teeth caused an exacerbation of the pain. The diagnosis was acute phlegmonous osteomyelitis. The prognosis was somewhat guarded, with expectation of a cure in about two months. An incision was applied passing three centimeters from above downwards and slightly backwards in front of the external posterior side of the masseteri; on reaching the periosteum, thick greenish-yellow pus was voided. The wound was drained with gauze soaked in luke-warm Dakin's solution, and hot applications of this solution were applied twice daily. The postoperative course was favorable, the fever diminished and the swelling decreased. Ten days later, the patient could open his mouth, and the second and third molars were removed. He was still in the hospital at the time of the report. According to the anatomo-pathologic report, the cement of the third molar had almost entirely disappeared. The root apices were necrotic. Both these teeth presented penetrating caries with gangrene of the pulp. The author points out that the infection, before becoming externalized through the paradental space, followed the root-canals, the most common avenue especially in youthful individuals, by which infectious germs are carried to the alveolar floor, within the structure of the osseous tissue. The sequestra in mandibular osteomyelitis are represented by necrotic teeth, which although rarely causing deep abscesses, usually give rise to a slow, persistent discharge of pus which may ultimately lead to ulceration of the stomach and other disturbances. Clinical and ana-

tomical recovery is assisted by the complete removal of the sequestrum in the first place, and next by the individual power of resistance of the mouth-cavity.

**A Case of Multiple Epulides.** W. Warwick James. *The Lancet*, London, 1919, ii, p. 156.

In the remarkable case observed by the author, concerning a girl of eleven years, the growth of a fibrous epulis, in the form of hypertrophy of the fibrous tissue of the gingival mucoperiosteum was associated with each erupted tooth of the temporary and permanent series. The bone was not involved, as shown by radiography. The gingival margins were considerably enlarged and nodular. The tissue particularly involved was apparently the gum margin and the neighboring portion, but not the greater part of that covering the roots. The fibromatous growth had extended round the crowns, in parts even reaching to the top of the teeth. Superficially the growth resembled a simple fibrous epulis, but was not pedunculated. The peculiar mouth condition made its appearance at the age of three years. Pain was absent, but there was some impairment of the general health, probably due to difficulty in chewing. Treatment in the past had consisted in extraction of all the temporary and eight of the permanent teeth, in seven separate operations; complete excision of the growth; and removal of the alveolar margins. Repeated attempts at removal of the abnormal tissue under preservation of the teeth were soon followed by a recurrence of the growth. At the time of the report, the lower canines and the left lower second premolar were involved, as well as the right upper premolar. The author comments that it would be a very drastic procedure to remove every tooth and so render the child edentulous. Meanwhile, the patient has been wearing a vulcanite block to bite upon, and an artificial denture can, of course, be provided if extraction should prove the only resource. The condition in this patient would probably be described as hypertrophy, and although a certain number of cases have been recorded, they are undoubtedly rare. Microscopical examination showed the abnormal tissue to be purely fibromatous.

**The Entameba Buccalis in Pharyngology and Rhinology.** C. E. Benjamins. *Archivo Italiano di Otologia*, 1919, xxx, p. 100.

The author's rhinologic investigations were preceded by observations concerning the presence of the entameba in the mouth, this demonstration possessing great importance for the rhinologic field. The following method was employed: Some material was removed with an instrument from the gum margins and the crowns of the teeth, even in the best kept teeth, a sufficient quantity of this so-called white matter was obtainable. In various teeth, the contents of the cavity were likewise examined. Two specimens were prepared for each experiment. The investigations covered 122 teeth, healthy or variably diseased, in 116 individuals. The presence of the entameba was demonstrable in altogether 69 cases, and its absence in 53 cases. Dividing the material into cases of pyorrhea alveolaris and teeth free from pyorrhea, the entameba was found to

be present in 35 cases of pyorrhea and in 34 teeth free from pyorrhea; it was absent in 6 cases of pyorrhea and in 47 teeth free from pyorrhea. All writers are agreed that scrupulous care of the teeth exerts an influence on the frequency of amebas in the mouth cavity, and the author in a general way is enabled to confirm these findings, in spite of the occasional occurrence of a large number of amebas in well-kept mouths. The age of the individual plays an important part, the percentage increasing with advancing years. The majority of negative cases are observed in children. In order to judge the results, the age of the examined persons must therefore always be taken into consideration. It is also noteworthy that the chewing of tobacco exerts no influence on the presence or absence of the ameba. Many of the microorganisms were found by the author in the mouths of some individuals who moderately chewed tobacco. In dental caries, the same positive findings were noted as in healthy teeth; hence no causative relation can be established between the presence of the ameba and this dental disease. Conditions are different in pyorrhea alveolaris, where the author like other observers found a large percentage of positive cases. However, this does not prove a causative relation, but at most a certain connection between the pyorrhea and the presence of the ameba, perhaps due to positive chemiotaxis and cooperative auto-disinfection of the mouth. In a general way, the pathogenic action of the entameba on the above-mentioned dental diseases can not be considered as demonstrated by the available findings.

The occurrence of the *Entameba buccalis* outside of the mouth cavity is rather uncommon; this being in part accounted for by the slight mobility of this microorganism. Its penetration into the tonsils can take place mechanically with the saliva. In a number of negative findings in the tonsils, a negative result was likewise noted in the examination of the teeth. The positive results in the tonsils, namely, six times in healthy organs and four times in an about equal number of diseased organs (altogether sixty tonsils were examined), do not support the theory of the pathogenic character of the *Entameba buccalis*. The author accordingly concludes that there exist no pharyngologic or rhinologic reasons for exterminating the ameba.

**Vincent's Disease.** Glenn L. Pell. *The Dental Summary*, 1919, xxxix, No. 8, p. 615.

This affection, also known as ulcerative gingivitis and trench mouth, is characterized by the formation of ulcers on the gingivæ, buccal mucosa and soft palate, covered by a grayish-white pseudomembrane. On the infected gums, extending from the free margin toward the roots, there is a dark red zone from one to four millimeters in width. Some or all of the teeth may be affected. The condition is aggravated by the presence of tartar, ill-fitting crowns, overhanging fillings, broken-down roots, cavities and inflammatory conditions over and around partially erupted third molars. Constitutional disturbance if present is slight, but severe pain is often complained of. The recognition of this disease is especially important on account of the similarity of the lesions to syphilitic ulcer. The diagnosis is based on the demonstration of Vincent's bacillus and

the spirillum that always accompanies it. The treatment consists in the local application of medicinal methylene-blue or methyl-violet; the success of the remedy depending greatly upon getting the medicament in contact with the organism. The prognosis is very favorable under proper and consistent treatment, as follows: Spray the mouth thoroughly with an antiseptic solution; mechanically remove food debris and sloughed tissue from the gums. Further cleanse with small pledget of cotton, saturated with hydrogen peroxide, followed by antiseptic spray, dry gums, and apply either methylene-blue or methyl-violet with a small pledget of cotton (about the size of a pin head) working it down to the bottom of the ulcerated surfaces. Methyl-violet proved the more potent remedy of the two in the author's experience. The application should be repeated in detail daily as long as necessary, then gradually extending the time between sittings to two, three, four days, or a week, as indicated by the clinical manifestations. All depositis of calculus, overhanging fillings or improperly fitted crowns should be removed as early as possible during the treatment, in order to eliminate the resulting irritation. As a mouth wash, a tablespoonful of a strong solution of potassium permanganate (14 grains in 6 fluid ounces of water) to one-fourth glass of water, should be used every two hours.

**The Diagnosis and Treatment of Oral Infections. A. M. Nudine. The Dental Cosmos, 1919, lxi, No. 8, p. 726.**

*Conclusions:* 1. The dental profession has been raised to a higher plane by the establishment of the fact that oral infections have a positive effect on the health of the individual. 2. The establishment of this fact is due largely to a more exact diagnosis by the use of the x-ray employed to discover these infections. 3. The public is demanding better dentistry and is placing its confidence in the dentist who employs the x-ray and other diagnostic agents to discover these infections. 4. The dentist should so practice his profession, or employ such methods as will obviate the possibility of the teeth and tissues upon which these methods are practiced becoming foci of infection. 5. When these infections are discovered they must be eradicated in a careful, complete and surgical manner. 6. The present and future health of a patient must be preserved regardless of the fact that teeth may be sacrificed to do so. 7. The prevention of the conditions which make possible these focal infections is the highest form of service a dentist may render. He may be able to restore only in an incomplete functional manner.

**Dental Conditions at an Ante-Natal Clinic. J. W. Ballantyne, British Medical Journal, 1919, ii, p. 103.**

A systematic examination of one hundred consecutive patients in the ante-natal clinic of the Edinburgh Royal Maternity Hospital showed the existence of a deplorable state of affairs: In only two expectant mothers (young women 23 years of age) were all the teeth present in an undecayed condition; all the

other patients had more or less defective teeth. Fifty-six per cent of all these women were 25 years old or less, and half of them were primiparas. Nearly half of the entire number (48 per cent) were wearing false teeth, eight having two plates and thirty-eight a single plate. The existence of this alarming amount of dental deficiency and disease, often concomitant with oral sepsis, can not fail to react injuriously upon the mother's digestion and through it upon the nutrition of her unborn infant. For these and related reasons, the author emphasizes the need of preventive dentistry in young women who may at any time become expectant mothers. A beginning might be made by the temporary appointment of dental physicians to maternity hospitals not already furnished with them. The desirability of greatly increasing the facilities for tooth saving by means of stopping, crowning and the like, is strongly suggested by the study of the cases at the Edinburgh Royal Maternity Hospital. Moreover, the further investigations of these and similar sets of cases at ante-natal clinics may throw some light upon the causation of dental caries in pregnancy.

**The Habitat and Distribution of Dangerous Streptococci in the Body.**  
D. J. Davis, *Illinois Medical Journal*, 1919, xxxvi, No. 3, p. 134.

On the teeth and about the gums are found the *B. fusiformis* and spirochæta, on the buccal mucosa and pharynx the streptococcus viridans and often varieties of pneumococci. Under certain conditions these organisms may be pathogenic and are therefore dangerous. Potentially dangerous hemolytic streptococci occur in the tonsil crypts in practically 100 per cent, in both normal and abnormal throats. In the mouth and teeth they are practically absent, except when pyorrhea and abscesses occur. On the basis of his investigation, the author arrives at the conclusion that there is normally only one habitat for hemolytic streptococci namely the crypts of the faucial tonsils; from here by surface extension, by contact, and by dissemination of buccal and throat secretions these cocci are distributed to various parts of the body. After tonsillectomy, these streptococci in the throat are much reduced in numbers and frequency. In the small percentage of positives after tonsillectomy their presence may be explained by tonsillar remnants and by chronic infections about the throat, teeth and sinuses.

**Some Causes for Periapical Infections with the Pathology.** C. J. Grove.  
*The Journal of the National Dental Association*, 1919, vi, No. 8, p. 1909.

The author's experience shows that seventy-two per cent of pulpless teeth have infections, the predominating organism being the streptococcus. In view of this high percentage of infections of pulpless teeth and the production of many grave systemic disturbances directly from such conditions, he believes that teeth which are even questionable should never be retained. The only proper course to pursue in such cases is the complete eradication of the infections by means of dental extraction and thorough removal of the infected bone. With special reference to the pathogenesis, the author's investigations indicate that the num-

ber of periapical infections resulting from the unnecessary operative destruction of periapical tissue is greater than is generally assumed. He doubts very much if the human hand can ever acquire the necessary skill to make perfect root fillings without producing grave injury to periapical tissue; neither can periapical infections ever be prevented by such means. While not condemning root amputations absolutely, he emphasizes his disappointment with the results obtained, and his avoidance of these procedures unless requested by the patient and then only with the understanding that it is likely to be a temporary success.

**A Diagnostic Sign of Maxillary Constrictions of Reflex Origin. Roy. La Restauration Maxillo-Faciale, 1919, p. 2.**

In the presence of traumatic constriction of the jaws of reflex origin, pressure exerted by a tongue-depressor on the base of the tongue, without necessarily exerting much pressure upon the lower jaw, causes a temporary disappearance of the constriction which permits the rendering of an easy and absolutely reliable diagnosis of the reflex origin of the contracture. Although this sign is not claimed to exist in all constrictions of reflex origin, the statement may be made that it never exists in constrictions of organic character, unless these are combined with a certain degree of reflex contracture. Consequently, the demonstration of this sign in patients suffering from contractions of the jaws may be considered as invariably pointing to the diagnosis of reflex constriction of the maxillæ of psychopathic origin.

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## EDITORIALS

### The National Dental Association and the Dental Corps

WE have before us the various dental journals for September which are supposed to contain the program of the meeting of the National Dental Association which will be held in New Orleans in October. In looking over this program one is impressed by the large number of subjects that have been brought together in the various sections; which indicate that the officers of the association have been trying to arrange a program that will be of importance and of benefit to the dental profession. However, considering all the good things that are present in this program, one can not help but observe the entire absence of any recognition given to the dental corps as a whole. It is true that we find the names of several men who have been prominent in dental services in the army under various sections, but we find no department devoted to the



dental corps exclusively, neither do we find any recognition given to the men who gave up their profession and practices and responded to the call of their country.

In the 1918 meeting considerable recognition was given the dental corps. This was probably because at that time the United States was actively engaged in war, and also because some of the men prominent in the National Dental Association were also prominent in the army dental corps. We do not believe that just because the war is over, so far as actual fighting is concerned, the dental profession should forget the services that were rendered by men who did active duty either in this country or abroad. In fact, it seems to us that at the present time, the men in the dental corps should receive special recognition. They are now in a position to present to the dental profession information and facts that are much more valuable than anything that could have been contributed in 1918. From close association with some of the men who are at present in the dental corps, especially in the maxillo-faciale department, we are convinced that no branch of dentistry or group of men could show the dental profession so much of value and interest as could the men now active in the maxillo-faciale department.

The indifference which the National Dental Association has assumed towards the dental corps, especially the maxillo-faciale division, and the attitude which was held by the American Medical Association towards the same department at its meeting in June is exceedingly conspicuous. One of the most talked-of exhibits or departments of the American Medical Association meeting at Atlantic City was that of work done as shown by the men of the Walter Reed Hospital. The men now engaged in this work are doing so at a great sacrifice, and have not the glamour of a nation in actual warfare, or the beating of drums to urge them on, such as was customary in the 1918 meeting. They are making a professional sacrifice so far as private practice is concerned by rendering the country a service and doing work for the injured that certainly will not be forgotten by those who receive relief in the Walter Reed Hospital. However, the National Dental Association as a body did not think enough of their work or efforts to give them a place on the program or ask them to make an exhibit, according to the program published in the September issue of the Journal, or to give the dental corps any recognition as a body by devoting a part of the program to their work. It is true that there will be a meeting of the Association of Military and Dental Surgeons in New Orleans, but this meeting will be held as a separate organization and in no way be connected with the National Dental Association. Saying the least, some one has been negligent in not asking the dental corps to take part in the program, and an opportunity for the profession to gain valuable knowledge has not been taken advantage of.

Knowing as we do of the enormous amount of work that is being done by men in the dental corps at the present time, especially the maxillo-faciale division, we regret that their work can not be placed before the dental profession as a whole, as it should be, because of an oversight on the part of the management of the National Dental Association.

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## ORIGINAL ARTICLES

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### DIMENSIONS VERSUS FORM IN TEETH AND THEIR BEARING ON THE MORPHOLOGY OF THE DENTAL ARCH\*

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BY MILO HELLMAN, D.D.S., NEW YORK CITY

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"We biologists can not too frequently and too emphatically deplore the mathematical mania through which men of considerable ability have been misled to pose as defenders of an erroneous conception. This mania is that no science is accurate until its results can be mathematically expressed." (Minot.)<sup>1</sup>

IN the advancement of new ideas bearing upon the more intricate problems associated with processes of life, there is often evinced a tendency of obscuring the real purpose by misleading representations and confusing deductions. The desire of demonstrating their self-importance and originality, often prompts some conscientious and capable workers to resort to exaggerations that not only tend to overbalance the point of benefit to be derived by their labors, but also create a disposition of antagonism that frequently leads to a rejection of the principles involved.

In orthodontia no less than in other fields of scientific work, original methods of procedure pertaining to the correction of occlusal anomalies are advanced with regular frequency. The vehemence with which they are brought forth often sets the profession aglow with ecstasy over the marvelous achievements attainable,—provided the one or the other principle, method or formula be adopted in practice. Many were the occasions within the last decade when, so-called, basic principles were propounded for the simplification of the scheme involved in treatment; but no sooner were they espoused as the *panacea for all orthodontic ills* when their doom was inevitable.

The one idea still lingering in the minds of many orthodontists, and frequently giving rise to impetuous controversies is *that the form assumed by the*

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\*Read at the meeting of the Dewey Alumni Society, St. Louis, Mo., April, 1919.

human dental arch is dependent upon the dimensions of certain teeth constituting it. This contention in its broadest aspects is inseparable from several assumptions; namely,

1. That there is a definite relationship between the *size* of the teeth and the *form* of the dental arch.
  2. That by the employment of certain methods of calculation, using the dimensions of the teeth as a basis, a formula, diagram or plan of that form of the dental arch can be obtained in a case of malocclusion which nature would have produced had no interference occurred.
  3. That by following the procedure advanced, uniform success is assured in the treatment of every case of malocclusion.
  4. That the propounded methods are universal in their application.
- The main contention at issue, however, upon which the entire scheme is







			1	2	3	4	5	6
FORMS OF DENTAL ARCHES OF ANTHROPOID APES								
			PYRIFORM	U-SHAPED	DIVERGENT	Ω-SHAPED	SADDLE-SHAPED	LYRIFORM
GENERA	Gibbon	Upper		4.84	14.51	3.23	2.42	75.00
		Lower		0.83	85.83	10.83	1.67	0.83
	Orang	Upper	38.55	28.91	10.80	20.48	1.20	
		Lower	5.33	40.00	20.00		34.66	
	Gorilla	Upper	15.38	46.13	15.38		23.07	
		Lower		21.74	43.48		34.78	
	Chimpanzee	Upper	8.00	8.00	28.00	16.00		40.00
		Lower	8.33	4.16	66.66	20.83		

Fig. 1.—Diagrammatic illustrations of arch forms of the anthropoid ape dentitions and their frequency of appearance in both jaws expressed in percentage.

based, rests on the premise that there is a *definite relationship* between the *size of the teeth* and the *form of the arch*. Without attempts at an explanation or verification of the truth of such a *presumption*, it is universally proclaimed and severally accepted as a *fact* and thereupon utilized in the construction of most pretentious methods by which formulæ are obtained that are of general application in the correction of occlusal anomalies. Granting, only for the sake of argument, that the older methods of treatment were based upon error—as is usually claimed, by the promoters of the various new schemes—it devolves upon the verification of the correctness of the methods advanced whether they are justified in superseding their predecessors. Since, however, scientific evidence besides mathematical calculations, bearing upon the fundamental principles is rather meager, the entire proposition may be considered as an open question. Therefore, before accepting and putting any such theory into practice, it is justi-

fiable to take it to test and see whether its fundamental principles may be either corroborated or refuted. This is the scientific way, for science is nothing more than tested and verified truth.

Owing to the complexity in the organization of the human organism, it is difficult to single out any particular morphologic unit whose simplicity will lend itself for the purpose of investigation to determine the various phases within which it may be manifested. The range of variability of such units in man is so extensive and so gradual in its transitional aspects from one form to another as to preclude the possibility of an exhaustive examination necessary to a clear understanding required for general deductions. It is therefore of considerable advantage to confine such investigations in the study of animals exhibiting closely allied characters to those sought for in man and note their behavior under similar conditions.

The dentition in the anthropoid apes, for instance, presents many characteristics that render it similar to that in man. Except the canines, lower first premolars and some minor anatomic details, the teeth of the orang, gorilla, chimpanzee and gibbon bear morphologically and numerically a close resemblance to those in man. Physiologically, they constitute the omnivorous type, being utilized in the mastication of a variety of foodstuffs; such as fruits, vegetables, insects, and birds.

The dental arch of the anthropoid ape, though bearing less resemblance to that in man than the teeth themselves, nevertheless, presents a variety of forms, so limited in number and so easily distinguished as to lend itself very advantageously for the purpose of study. Thus, the dental arches of the anthropoid apes are found to assume the six forms illustrated in Fig. 1, which represents a diagrammatic outline of the curves in which the teeth are arranged in the jaws. For the purpose of clearness these forms are named severally: Pyriform, U-shaped, Diverging, O-shaped, Saddle-shaped, and Lyriform as noted in Fig. 1. These forms are not equally distributed among the various genera, neither do the dentitions of all the individuals of each genus assume the same arch forms.

Thus, the dental arch form of the orang, for instance, may be classified in accordance with the following outlines:

1. The Pear-shaped (Pyriform) arch;
2. The U-shaped arch;
3. The Diverging arch;
4. The O-shaped arch;
5. The Saddle-shaped arch;
6. None of the Lyriform type.

Those of the gorilla present the following forms:

1. The Pear-shaped arch;
2. The U-shaped arch;
3. The Diverging arch;
4. None of the O-shaped type;
5. The Saddle-shaped arch;
6. None of the Lyriform type.

While the arch form of the chimpanzee conforms to the following outlines:

1. The Pear-shaped arch;
2. The U-shaped arch;
3. The Diverging arch;
4. None of the O-shaped type.
5. The Saddle-shaped arch;
6. The Lyriform arch.

And the arch form of the gibbon conforms to the following outlines:

1. None of the Pear-shaped arch;
2. The U-shaped arch;
3. The Diverging arch;
4. The O-shaped arch;
5. The Saddle-shaped arch;
6. The Lyriform arch.

The frequency of appearance of these forms in the various genera may be seen expressed in percentage in the Table (Fig. 1).

With the object in view of testing first the assumption regarding the relationship of the dimensions of the teeth to the form of the arch, it is necessary, for obvious reasons, to bear in mind that if the dimensions of the teeth would yield a clue to that form of dental arch within which they will align themselves under normal conditions, then, given a series of normal arches of a certain form, the homologous teeth should be of similar sizes. Or, taking the homologous teeth of the different individuals possessing the same form of arch they must collectively have a higher average value than those of the diverse dental arches. Conversely, given the size of homologous teeth of dentitions presenting different arch forms, they should be found to present a greater dissimilarity than those found in the same arch form; or their combined size should present a lower average. The results, however, do not correspond to either of these expectations.

Taking the most frequently occurring form of the upper dental arch in each genus, the following application was made. The dimensions of the mesio-distal diameter of the central incisors were obtained and as the individual teeth were found to vary considerably, a comparison was made which was based on the *average* dimensions of the teeth found in homologous arches in order to determine the extent of difference from those belonging to heterologous forms. The results obtained may be summed up as follows:

The upper dental arch form appearing with greatest frequency in the gibbon is the *lyriform*. The mesio-distal diameter of the central incisors found in this arch *ranged from 3.5 mm. to 6 mm.*, while the *average was 4.84 mm.* The range of variation in the mesio-distal diameter of the central incisors of the same genus embracing *all* arch forms *ranged from 3.5 mm. to 7 mm. and averaged 4.88 mm.*, showing a difference of 0.04 mm. Of course, the difference is negligible, but *there should have been a considerable increase in the average of tooth size of a uniform arch, if tooth size and arch form were correlated.*

The application of this test to the other genera of the anthropoid family brought about results of a similar character.

Thus, in the orang, the arch form of the upper jaw which appears most frequently is the *pyriform*. The incisors which were measured in those arch

forms averaged 13.13 mm., while those of the various arch forms combined averaged 13.02 mm. In the gorilla the U-shaped arch appears with the greatest frequency in the upper jaw. The central incisors of that arch form averaged 13.13 mm. The central incisors of the combined arch forms averaged 13.14 mm. The chimpanzee has the lyriform arch in the upper in greatest frequency and the incisors therein averaged 11.62 mm., while the incisor of the combined arch forms averaged 11.31 mm.



A.—Front view showing incomplete eruption of the upper central incisors.



B.—Right side view showing occlusion, missing lower and disintegrated upper deciduous teeth.



C.—Left side showing similar condition as in B.



D.—Occlusal view, showing deformed dental arches.

Fig. 2.—Case of malocclusion not infrequently met with in orthodontic practice, showing the incisors and first permanent molars as the only teeth measurable.

It is, therefore, quite plain that there is no difference, or a negligible one, in the correlation of the average mesio-distal dimensions of the incisors associated with various arch forms or of those associated with a particular form.

It was then of interest to ascertain whether there is any correlation between like dimensions of different teeth in each dentition presenting the same arch form. For, it was thought that the great variability of one tooth may be counteracted by a reverse condition of another, but their combined dimensions may bear a correlation to the form of dental arch. Therefore, given the dimensions of certain teeth of different denominations in dentitions having the same form of arch, there should be some sort of correlation between them if their size has any bearing upon arch form. This matter was subjected to the following tests: The upper central incisor and first molar of the permanent series, associated with the various arch forms, were carefully measured and their relative size noted.

It may be asked, and justly so, why, of all the teeth in the denture, were the central incisor and the first molar selected to bear the brunt of the burden? To which it may be answered that of all the baffling problems confronting the orthodontist relative to the form of the dental arch, the most perplexing ones are presented by conditions as illustrated by the case shown in Fig. 2, *A, B, C, and D*. And if the measuring of teeth is to be of any benefit in outlining the form of arch, its value will be inestimable if it be applicable in this type of case. It must be said at this point that this type of case is quite frequently met with in practice. Upon examination of this case, it will, at once, be apparent that of all the teeth present, the only ones measurable are the central incisors and the first permanent molars. The other teeth as may be seen are either disintegrated or entirely lost. Furthermore, if measurements be taken of the central incisors, the only reliable dimensions obtainable in this case are those of the mesio-distal diameter. The labio-lingual or the gingivo-incisal dimensions could not be obtained because of the incomplete eruption of those teeth. Of the molars, on the other hand, the bucco-lingual diameter can be more easily obtained in conjunction with the mesio-distal dimensions.

Thus, if there be any basic truth in the contention that there is a relationship between arch form and tooth dimension, there must also be a correlation in the sizes of the various teeth of each dentition conforming to the same arch outline. That is, taking the central incisors and first permanent molars of dentitions showing the same form of dental arch, they should show a correlation in size to each other. For instance, of the thirty-two orang skulls presenting the pear-shaped (pyriform) arch form in the upper jaw, the mesio-distal diameter of the central incisors showed no uniformity but varied from 9.5 mm. to 16 mm., while that of the first molar ranged from 11 mm. to 15 mm. The correlation of the dimensions of these two teeth may be seen in Fig. 3, which is a graphic representation of these combined measurements arranged in the form of curves, the horizontal lines (not visible in the illustration) indicating the measurements of the teeth in millimeters, while the vertical lines indicate the inciso-molar relation of each dentition exhibiting the same arch form.

As may be noticed, the line I which represents the mesio-distal diameter of the incisors ascends gradually, while the line M which represents the dimen-

sion of the related molars is irregular; showing *no correlation whatever* between the two. The relation between the bucco-lingual diameters of these teeth may be seen in Fig. 4 which was constructed on the same scheme as Fig. 3 and yielded similar results. Of most interest is the fact that *not even the mesio-distal and bucco-lingual dimensions of the same tooth in dentitions presenting the same form of arch, showed any correlation.*

On the examination of the possible correlation of the sizes of the teeth in the rest of the arch forms of the orang and in all the forms of the gorilla, the chimpanzee and gibbon, similar results were obtained. *It may, therefore, be*

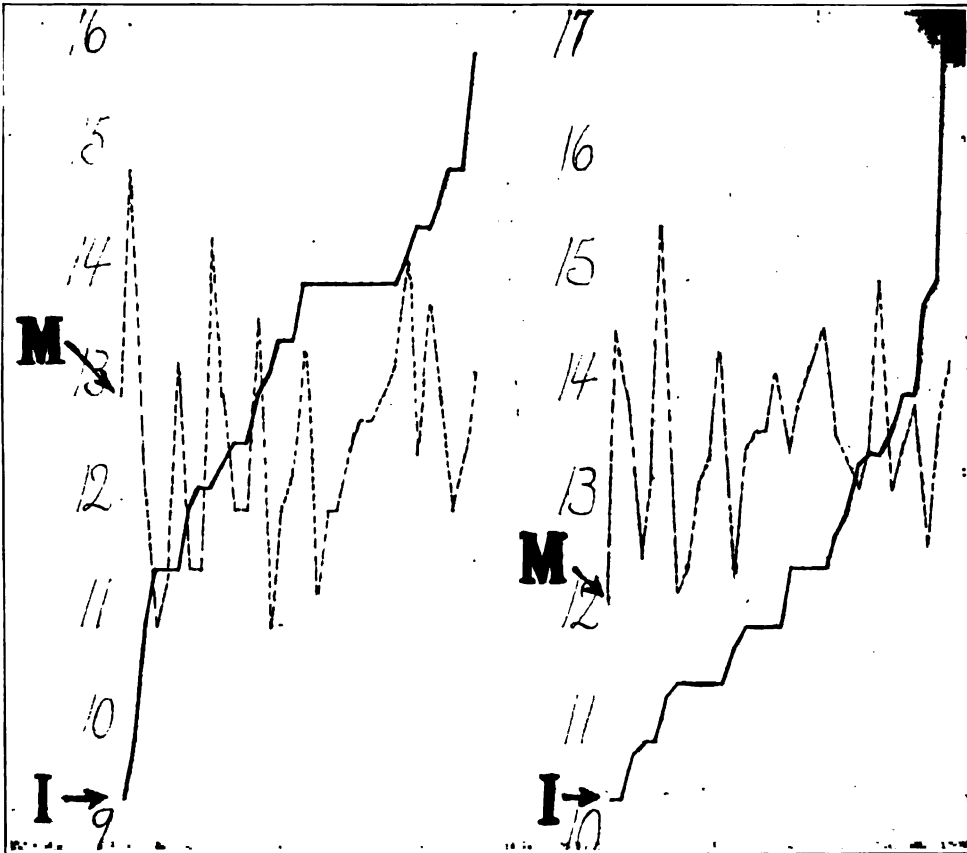


Fig. 3.

Fig. 4.

Fig. 3.—Illustrating curves based on the mesio-distal diameter of incisor and molars of the dentitions conforming to one arch outline, showing no correlation in the sizes of these teeth. Heavy line marked I indicates incisor curve, broken line marked M, molar curve. Numbers indicate dimension in millimeters.

Fig. 4.—Illustrating labio-lingual dimension of the central incisor and bucco-lingual dimension of the first permanent molar as in Fig. 3 showing no correlation. (Markings as in Fig. 3.)

*concluded that in the anthropoid apes the form of the dental arch has no relation to the size of the teeth.*

Since professional engineers have become interested in orthodontia, a term has been coined for the purpose of expressing tooth dimensions quantitatively; that is, such words as "tooth-material" are employed; I presume to convey a similar idea of the structure of the dental arch as brick, steel or concrete is used in the construction of a building.

It must be stated at this point that the measurement of teeth is a very much



different, more difficult and less accurate process, for it involves a rather peculiar proposition. If the greatest mesio-distal dimension is obtained, it gives a diameter of the tooth at a level usually near the incisal edge or occlusal surface. If the labio-lingual diameter is given, the dimension is obtained at a different level usually near the gingival margin. We, therefore, possess dimensions of a rather peculiar character. They can neither convey an idea of the square as they are not obtained on the same plane nor of the cube as there are only two dimensions. Moreover, the levels of the teeth at which these dimensions are obtained represent such difference in form and contour that it is impossible to obtain a definite conception of the quantity of tooth structure involved. It is therefore erroneous and misleading to speak of tooth material when the quantity thereof can not be ascertained. A similar error was made by Dr. Bonville in the measurements of the "equilateral triangle" of the lower jaw. The points utilized were the centers of condyles and the interproximal space between the central incisors. The condyles as is well known are on a different horizontal plane than the occlusal surfaces of the teeth. The measurements were, therefore, obtained under similar complications. But this did not deter him or many others from formulating the pretentious methods so well known to the profession for ascertaining or "predetermining" the form of the dental arch.

Another pertinent question relative to tooth size and arch form may be asked of the dental mathematicians; namely, if the *form* of the dental arch is revealed by the *dimensions* of the teeth, why is it that despite the great difference in size between the upper and lower homologous teeth, all the calculations produce a like figure or outline for the form of the upper and lower dental arches? If a particular form of arch is obtainable only by one set of dimensions, and the same form is also obtainable by a different set of dimensions, as would necessarily be the case if the lower dental arch would be designed according to the same methods as employed for the upper, it may be inferred that the form of the dental arch is not so very much dependent upon the actual sizes of the teeth, but rather upon the methods of manipulating the figures involved. It has been stated, on the one hand, some time ago by Mr. Hanau, the originator of "orthodontic engineering," that one set of measurements may give rise to many different curves. But as it is demonstrated in practice different sets of measurements as obtained from the upper and lower teeth, respectively, may give rise to one curve for both upper and lower dental arches *it may be concluded that the mathematical method for disposing of this question is unsatisfactory*. Moreover, if there be any hope for a solution of the problem involved in the form of the dental arch, it must be sought for in other quarters.

Since form, according to the Standard Dictionary, is "the outward or visible shape of a body as distinguished from its substance or color; or the peculiar configuration by which an object is recognized by sight or touch," its explanation must proceed from the aspect of morphology. For, morphology, from the zoologic viewpoint, is the science of form and structure of animals, and being based on comparative anatomy and embryology lays the foundation of physiology. The form of the dental arch, to be thoroughly understood, must be interpreted from the morphologic aspect of its constituent parts before it is subjected to mathematical analysis for the purpose of "predetermining" it.

Thus, the teeth composing the dental arch of all placental mammals may easily be distinguished as belonging to either the upper or the lower dentition. For they differ generally in size, outline, contour and cuspidation. Owing to the difference in these general aspects, there is also a difference in their inter-relation or occlusion. As will be shown later, the result of all these differences

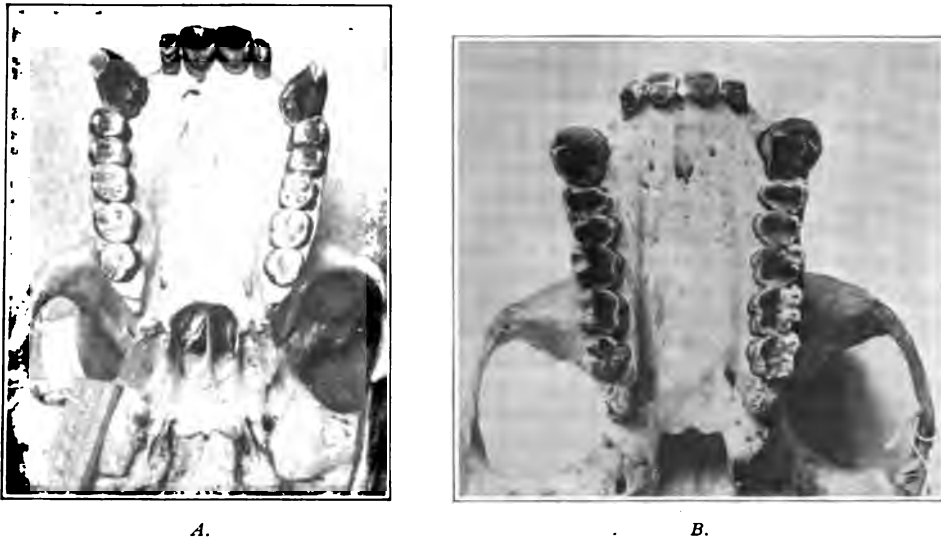


Fig. 5.—Illustrating pyriform dentition of orang and gorilla. *A.*—Occlusal view of orang dentition showing antero-internal position of canines in their mesio-distal axis and the generally rounded appearance of the curve of arch. *B.*—Occlusal view of dentition of gorilla showing a difference in the characters as outlined under *A.* i. e., antero-external position of the canines and the straight line assumed by the pre-molar-molar series.



Fig. 6.—Occlusal view of upper and lower dental arch of the gibbon showing position of canine and premolar in the conformation of the lyriiform arch. It also shows a difference in arch outline of upper and lower jaws.

manifests itself in a concerted effect that brings about a difference also in the form of the dental arch. But, although it is of common knowledge that the form of the teeth of the upper jaw in all placental mammals differs from that of the teeth in the lower jaw, it is as yet not generally recognized that the form

of the dental arch in the two jaws does *not* usually correspond to the same outline. The extent of this occurrence will be evident by the following example: Among the gibbons examined 16.67% of the individuals exhibited a like form of dental arch in both jaws, while 83.33% differed; among the orangs 28.95% conformed to the same arch outline and 71.05% varied; the gorilla conformed in 43.48% of cases and varied in 56.52%; and the chimpanzee showed the same arch form in 41.67% of cases and varied in 58.33%. The interesting feature of it is that the larger the number of individuals examined, the higher the percentage of variation appeared. Thus, of 23 gorillas 56.52% differed in form; of 24 chimpanzees, 58.33% differed; of 76 orangs 71.05% differed and of 120 gibbons 83.33% differed.

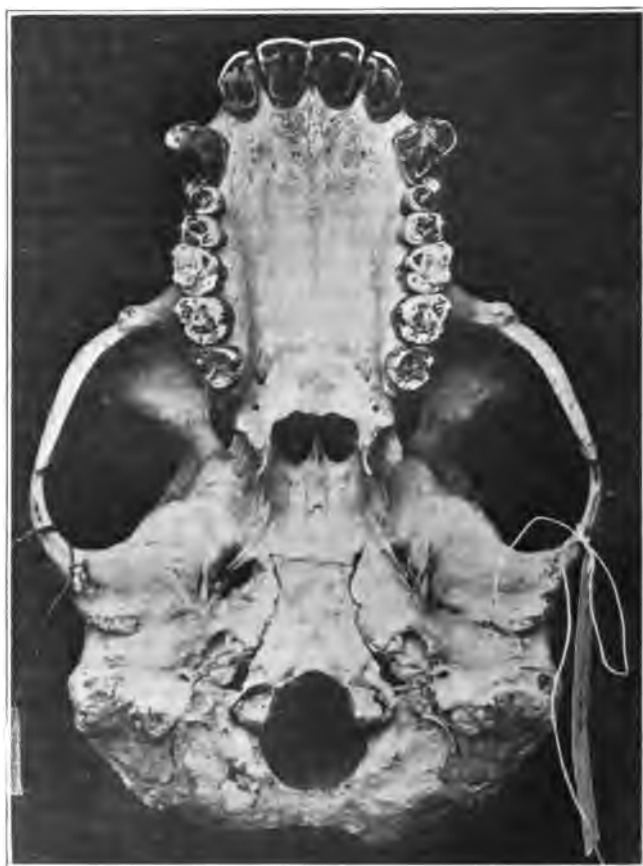


Fig. 7.—Occlusal view of a chimpanzee dentition showing position of canines and premolars in the conformation of the lyriiform arch.

Upon further examination of the teeth of anthropoid apes, the fact was revealed that not only is there a difference in the form and contour of the teeth belonging to the upper and lower jaws, but there are also differences manifested in the homologous teeth of each jaw in the different genera. For instance, it is not difficult to demonstrate that the upper molars of the gorilla differ considerably in their proportions from those of the orang, chimpanzee, and gibbon. The gorilla's upper molars are more elongated mesio-distally, while

the diameter of those of the other apes is greater bucco-lingually. The molars of the gorilla are more angular, while those of the other apes are more rounded. The cusps of the gorilla molars are triangular while those of the others are rounder, nipple-shaped, flatter, etc. The effect of these differences upon the alignment of the buccal teeth in their respective arches is such as to produce differences that are peculiar to the gorilla arch form. Thus, while the buccal teeth of the gibbon, orang and chimpanzee tend more to an arrangement in curved lines, those of the gorilla assume their position in straight lines. Moreover, the arch forms of the upper jaw, of greatest frequency occurring in the gibbon, orang and chimpanzee, correspond to the pyriform, lyriform, U-shaped and O-shaped, while those assumed by the gorilla dentition are limited mainly to the U-shaped, pear-shaped and divergent, presenting none of the lyriform or O-shaped variety. (See Fig. 1.) But even in the pyriform arch, the gorilla variety has the buccal teeth in more straight lines than those assumed in the orang, as may be seen in Figs. 5, *A*, and *B*.



Fig. 8.—Occlusal view of orang dentition showing position of canines in the conformation of the O-shaped arch.

Also, the form and position of the canines seem to have an effect upon the conformation of the dental arch. Thus, in the gibbon, the upper canines are sabre-like in shape. And in position, their mesio-distal axis assumes such direction as to present the mesial end antero-externally. This peculiarity, combined with the tendency of the premolars to migrate lingually, gives the upper dental arch the lyriform appearance. In Fig. 6 the position of the canine in its relation to the lyriform arch may be clearly seen as well as the differently shaped lower arch of the same specimen.

In the chimpanzee, though the canine has more of a tusk-like appearance, it exhibits the same peculiarity in position as in the gibbon, and combined with a similar tendency of the premolars, the arch form assumes a similar outline (see Fig. 7). These characteristics in the gibbon and chimpanzee are so persistent as to produce at times exaggerations in the form of anomalous occlusal manifestations, where the upper second premolars drift into lingual occlusion to the lower.

In the orang, on the other hand, the upper canines present a tendency of rotating in a reverse direction, the mesial surface being antero-internally and as

a result, there is a more evenly rounded form of arch produced, as the pyriform and O-shaped arch, as may be seen in Fig. 5*A* and Fig. 8.

In the gorilla, on the other hand, the mesio-distal axis of the upper canine invariably assumes a direction parallel to the buccal cusp of the premolar-molar series. The result in the arch form is of a nature as may be seen in Fig. 5*B*.



Fig. 9.—Side view of skulls of orang and gorilla. *A*.—Orang showing extreme curve of upper incisors in their long axis.



Fig. 9, *B*.—Gorilla showing straight line in the long axis of upper incisors.

The longitudinal axis of the teeth also shows a generic variability as may be seen in the incisor region of the gorilla as compared with the other genera. In the gorilla, the upper incisors are straight while those in the other genera are curved as is plainly visible in Figs 9, *A* and *B*.

As may be noticed in Fig. 6 (lower jaw) the position of the lower canine

is such as to present its labio-lingual axis anterior-posteriorly. The lower canine is therefore invariably included in the incisor curve in contradistinction to the upper which is more intimately associated with the premolar molar series. This difference in position of the canines in the upper and lower jaws, greatly influences the difference in form of the dental arches.

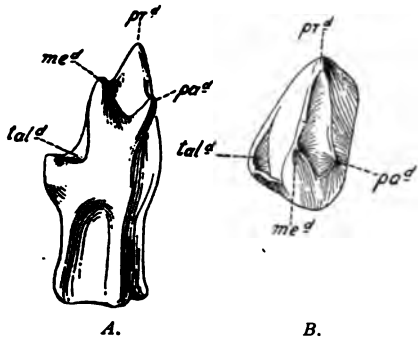


Fig. 10.—Showing lower left tritubercular molar of a primitive mammal (*Phascolestes*). A. Lingual view. B. Occlusal view (After Gregory).

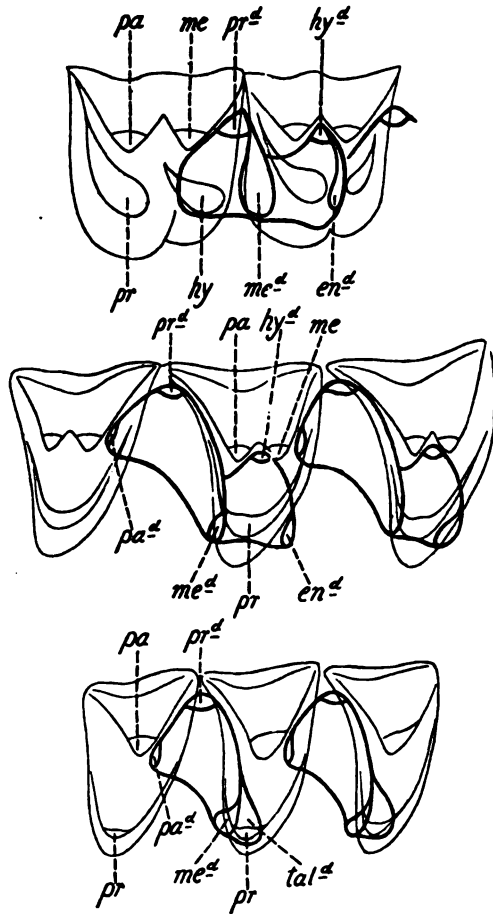


Fig. 11.—Illustrating occlusion of upper and lower molars in three stages of evolution. Lower teeth in heavy black lines. A.—Late Mesozoic stage, wedge-type occlusion. B.—Lower Eocene stage, based on many primitive mammals. Talonid of lower molars overlapping upper molars. C.—Upper Eocene and later stages antero-posterior diameter of molars increased talonid of lowers widened. (After Gregory.)

Fig. 11.

The difference in the form in the associated dental arches of one dentition, besides the causes already mentioned and those to be mentioned in subsequent contributions, may also be traced to certain positions of the molars and premolars and to their occlusion. It is a *primitive characteristic* of the upper molars to occupy such a position that the mesio-buccal angle is more prominent buccally than the disto-buccal angle. (See Figs. 5, 6, 7, 8, 16D). That is, if a line be drawn parallel to the buccal surface of the molars, its anterior end would point antero-externally. In occlusion, the mesio-lingual cusp of the upper molar, as is well known, is received in the central fossa of the lower corresponding molar. This is a primitive condition and is retained in the primates including man, although the

molar teeth have been modified during their evolution from a more ancestral type. The disto-lingual cusp of the upper molar, on the other hand, is received in the anterior or mesial fossa—the fossa situated between the mesial marginal ridge and the mesial inclines of the mesial cusps—of the lower molar behind. It de-

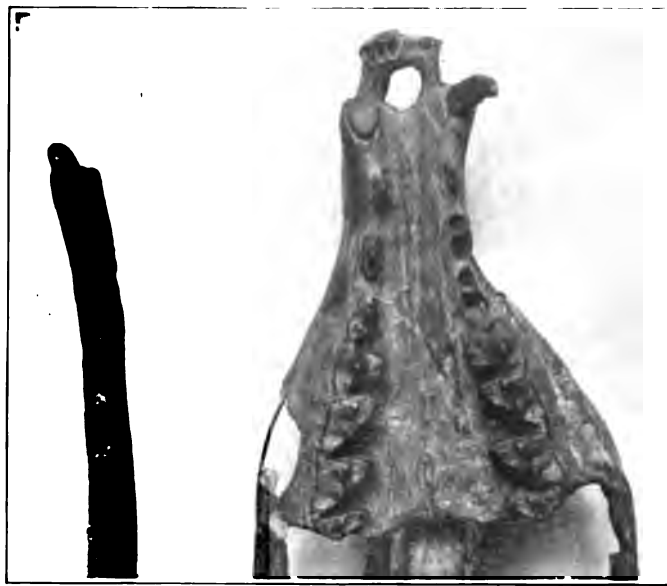


Fig. 12.—Occlusal surface of upper and half of the lower dentition of an Eocene carnivore (*Sinopa*) showing upper tritubercular molars and lower molars with fully developed heel.



Fig. 13.—Lingual view of dentition in occlusion of Eocene carnivore showing the lingual cusp of the upper molar fitting into the central fossa (talonid basin) of the lower molar.

pends, therefore, upon the position and form of the disto-lingual cusp of the upper molar as to the direction that the mesio-distal axis of the lower molar behind will take. And in proportion as there is the slightest variation in the primitive position of the upper molar in a rotary direction there will be an in-

verse modification of the alignment of the lower molars. As the mesial side of the upper molar will turn lingually the mesial side of the lower molar behind will turn buccally.

Another probable factor showing some influence upon the form of the dental arch is closely associated with the evolutionary process affecting the modification of the original tooth pattern and the occlusion of the dentitions of various placental mammals. Time and space will not permit to go into any detail at present, its elaboration being made in a subsequent contribution. Suffice it now to refer to this topic in a casual and general manner. Thus, it is a well-established fact, borne out by adequate and authentic paleontologic evidence that all placental mammals, according to Cope,<sup>2</sup> have at some period in the course of evolution passed through the tritubercular type of molar pattern. The tri-

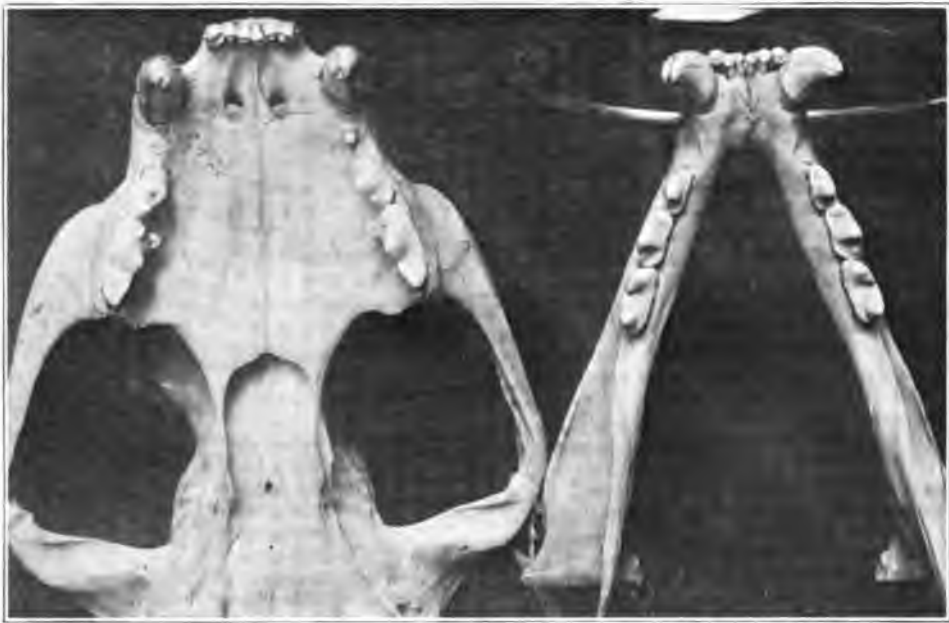


Fig. 14.—Occlusal view of modern carnivore (*Puma*) showing the extreme modifications in the dentition and the form of arch.

tubercular tooth, as may be seen in Fig. 10, *A* and *B*, presenting the lingual and occlusal views, respectively, of a lower left molar of a primitive mammal (*Phascol Estes*), of the upper Jurassic age, consists of three principal cusps and a rudimentary heel or talonid. The cusps are connected by marginal ridges. The occlusion according to Wm. K. Gregory<sup>3</sup> is of the interlocking or Wedge type as may be seen in Fig. 11, *A*. The lower molar fits into the interdental spaces of the upper.

During the further evolution, the subsequent stages of development are reached both in the modification of the tooth pattern and manner of occlusion as may be seen in Fig. 11, *B* and *C*. There is accordingly a continuous increase in the heel of the lower molars, and the occlusion is thereby changed from the interlock or Wedge-type to the interlocking and lapping type which persist



through the various orders of placental mammals and in a modified form even in man. This modification in the teeth and occlusion of the early predecessors may have had a strong influence, affecting the form of the dental arches in subsequent time.

Thus, we see in Fig. 12 (Sinopa) representing the casts of a fossil of an Eocene carnivore, the upper molars are still of the tritubercular type while the heel is fully developed in the lower. The lingual occlusion as may be seen in Fig. 13, shows the protocone or lingual cusp of the molar fitting into the heel



Fig. 15.—Side view showing incisor occlusion in the orang. A.—Orang dentition showing edge-to-edge bite.



Fig. 15, B.—Orange dentition showing overbite.

basin of the lower molar. This characteristic must be kept in mind for it is one of the most primitive features retained in modern forms.

The type of dental arch forms as seen in the Eocene carnivore (Sinopa), is considerably changed in the modern carnivora, as may be seen in Fig. 14 (Puma). Though still bearing a very *slight* resemblance in outline, the arches are considerably shorter and wider. The teeth, as may be observed, have undergone a considerable modification not only in form but also in number. The dental formula of the Eocene predecessor being I3, C1, P4, M3 in both upper and lower



Fig. 16.—Illustrations of casts of the Mousterian skull. *A.*—Showing anterior view and incisor edge-to-edge occlusion.



Fig. 16*B.*—Side view probably normal occlusion.

jaws while in the present carnivore it varies from  $\frac{3,1,4,2}{3,1,4,3}$  in dogs (bears, etc., to  $\frac{3,1,3,1}{3,1,2,1}$  or 0 in felines (Fig. 14). Similar changes in tooth and arch form have been traced in the various orders of placental mammals.



Fig. 16C.—Side view probably normal occlusion.



Fig. 16D.—Occlusal views, showing difference in the form of the upper and lower arches. In *A* and *C* the lower left permanent canine may be noticed as it is impacted below the alveolar process.

The shortening of the muzzle in the course of evolution brought about a twofold effect upon the dentition in different orders of placental mammals. Thus, as is seen in the carnivora, the shortening occurred posteriorly resulting in the reduction of the number of molars and premolars, while in the apes and man the reduction took place anteriorly in the premolar and incisor region. The anthropoids and man therefore have lost one incisor, probably the third, and the first two premolars of the original placental mammalian formula.

The consequent effect upon the original form of the primate dental arch is therefore closely associated with the modification in form and number of the teeth.

Another point of noteworthy significance is that the incisor occlusion in the various arch forms is never alike. It may be either in an edge-to-edge or in an overbite relation, as may be observed in different orders of mammals. For in-



Fig. 17.—Occlusal view of jaw of the Heidelberg jaw, showing canines included in incisor curve, and the premolars as the prominent points in the arch.

stance, in carnivora or perisodactyls it is an edge-to-edge, and in rodents it is an overbite relation. But this may also be observed in the apes and man. Fig. 15, A and B illustrates the incisor occlusion as found in the orang.

In the study of the dentition of man, these features must be kept firmly in mind. For, although they apparently are irrelevant in the relation to the human teeth, they will become important factors as their significance is appreciated.

Thus, early complete human dentitions manifest characteristics closely allied with those observed in the anthropoid family.

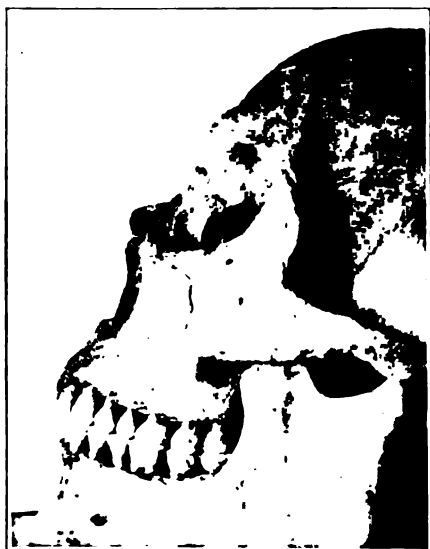
Fig. 16, A, B, C, and D presents the restored casts of a skull of one of the early forerunners of modern man, *Homo Mousteriensis*. (The skull belongs to the J. Leon Williams collection on exhibition at the American Museum of Natural History, New York.) The individual belonged to a Neanderthaloid Race and is estimated to have existed about 40,000 years ago. As will be ob-



A.—Front view showing considerable overbite in incisor region.



B.—Right side showing buccal teeth in "normal occlusion."



C.—Left side showing buccal teeth in "normal occlusion."



D.—Occlusal view, showing difference in conformation of the upper and lower dental arches.

Fig. 18.—Mongolian skull showing dentition in "normal occlusion."

served in Fig. 16, *D*, the teeth resemble those of modern man in form with the probable exception of the upper first molar which has a considerably larger disto-lingual cusp and the lower second premolar also exhibiting a similar increase in the distal half of its crown. The upper arch, as may be seen, resembles that of modern man quite closely, while the lower approaches more the form of more primitive races, as will be seen at once. Fig. 17 shows the occlusal surface of a cast by Professor McGregor, representing the lower jaw of the oldest human relic, the *Heidelberg Man*. Note the form of the dental arch as well as its close relationship to that of the Mousterian lower dental arch. In these, as well as in other primitive specimens of man and anthropoid lower dental arch forms, it is noticed that the canines do not form the prominent points as they do in the upper arch of the Mousterian and of some modern human forms, but rather are included in the incisor curve, so to speak, allowing the first or the second premolar to indicate the turning points of the curve of the arch. The statement must not be omitted that the occlusion of the Mousterian dentition was in all probability normal, but owing to a certain degree of warping in the right condyle region, the teeth are prevented from coming into close apposition.

In modern man, it is generally understood that the dental arches assume a like form in both the upper and the lower jaw. The examination of 3776 skulls both at the American Museum of Natural History of New York and at the United States National Museum at Washington, D. C., revealed the fact that also among the modern races of man, there is found considerable variation in this relationship. The illustrations in Figs. 18, 19, 20, 21, and 22 represent some of the best dentitions in normal occlusion selected from among the skulls examined. Thus, Fig. 18 represents a Mongolian skull, and its dentition as may be seen in *A*, *B*, *C*, is in normal occlusion. The premolar-molar series as seen in *D* and *E*, are similarly aligned in both jaws, but there is a difference in the curve of the anterior region; the upper arch presenting a different curve in the incisor-canine region than the lower. It must also be noticed that in the lower arch of these skulls, there is a considerable similarity in the anterior curve to the primitive form, the premolars forming the most prominent points. This peculiarity may be noticed in all the skulls illustrated. It is also of noteworthy significance to observe the considerable overbite in the incisor occlusion despite the fact that the teeth are considerably worn from use.

An extreme difference may be noticed in Fig. 19, *A*, *B*, *C*, and *D*, (Illinois Indian) the upper arch (*D*) being round in contour, while the lower approaches the saddle-shaped form of the anthropoids. Notice the edge-to-edge occlusion of the incisors, an Indian peculiarity. In the Eskimo, Fig. 20, *A*, *B*, *C*, *D*, and *E*, as will be seen, the upper arch forms are extremely broad and rounded in contour, converging slightly posteriorly, while in the lower the premolar-molar series are arranged in straight lines diverging posteriorly.

The Hindoo, Fig. 21, *A*, *B*, *C*, *D*, and *E* though exhibiting a contrasting upper arch form from that of the Eskimo, shows again a marked difference between the form of the upper and the lower jaws (See Fig. 21, *D* and *E*). Even the European White, Fig. 22, *A*, *B*, *C*, and *D*, shows that differences exist, as may be noticed in the evenly rounded alignment of the upper premolar-molar series



A.—Showing edge-to-edge relation of incisors.



B.—Right side showing normal relation of the buccal teeth.

Fig. 19.—Skull of Illinois Indian with teeth in "normal occlusion."



C.—Left side showing normal relation of the buccal teeth.



D.—Occlusal view, showing considerable difference in conformation of the two dental arches.

Fig. 19.—Skull of Illinois Indian with teeth in "normal occlusion."



*A.**B.**C.**D.**E.*

Fig. 20.—Eskimo skull with dentition in normal occlusion.

*A.*—Anterior view showing edge-to-edge relation of the incisors.

*B.*—Right side showing normal occlusion of the buccal teeth.

*C.*—Left side showing normal occlusion of the buccal teeth.

*D.*—Occlusal view of upper arch, showing difference in form from that of the lower.

*E.*—Occlusal view of the lower arch illustrating its variability in form from that of the upper.

as compared with the straight alignment of the lower homologous teeth. Also the primitive curve in the lower inciso-canine region may be observed.

The point, however, in which all these dentitions coincide is the primitive position of the molar teeth, the difference in the prominent points in the curve of the upper and lower arch, and the primitive cusp occlusion of the molars. The incisor occlusion, again as in the apes, is either in an overbite or in an edge-to-edge relation.

In summing up what has been stated, the following points may be emphasized:

1. That the tests made to ascertain whether there is any correlation between the size of the central incisors, based on individual and average dimension, and any particular form of dental arch in the anthropoid apes failed to prove the affirmative.

2. That the tests made to ascertain whether any correlation may be found in the dimensions of the central incisors and those of the first molars in the dentition of anthropoid apes having a like form of dental arch also failed to prove the affirmative.

3. That the difference in contour of the molar teeth of the gorilla, as compared to the other anthropoids, was found to have some bearing on the forms of dental arch in that genus; showing a probable generic difference in the anthropoid apes.

4. That the form and position of the canines and premolars in all anthropoids have a morphologic influence upon the outlines assumed by the various dental arches.

5. That evolutionary processes influencing such modifications as number, form, position and occlusion of the teeth, constitute a noteworthy factor in the establishment of form in the dental arches not only of the various placental mammals in general, but also of the apes and man.

6. That the forms of both the upper and lower dental arches in the anthropoids in the same individual *may conform* to the one outline but in the *greater percentage of cases they differ*.

7. That this difference may be due to a fundamental difference in the pattern of the teeth in the two jaws, as well as to the adherence to the primitive position of the molar teeth in the upper jaw.

8. That the extreme diversity in form of the human dental arch fails to obscure similar conditions as in the anthropoids. Thus, the difference in tooth pattern in the two jaws, primitive position and occlusion, also produces in man a difference in the form of the two dental arches constituting one denture.

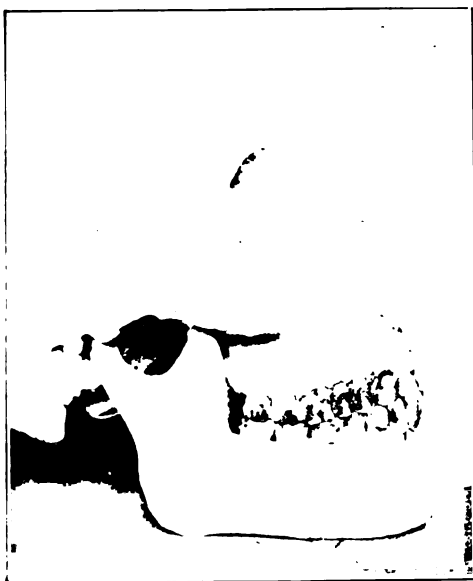
9. That the incisor occlusion in the human skulls examined, like that in the ape, is of a two-fold character. It may be in an overbite or edge-to-edge relation. And also that this is found to be in association with certain races more than with others. Thus, the Indians and Eskimos exhibit an edge-to-edge occlusion, while the whites and Hindoos a moderate overbite, reaching an extreme condition in the Mongolians.

10. And last, owing to the tendency of some races to exhibit certain associations with particular form of other features, as of head, nose, eyes, etc., it may eventually be proved that besides other factors, racial characters may

also stand in close relationship to the morphology of the dental arch. This, however, requires considerably more study, and will depend upon further investigation of this problem to reach a stage in which such conclusions may be arrived at with more certainty. With this end in view, too much credit can not be given to the American Museum of Natural History of New York and the U. S. National Museum of Washington for the remarkable work that is being done



A.—Anterior view showing moderate overbite of incisors.



B.—Right side showing normal relation of buccal teeth.



C.—Left side showing normal relation of buccal teeth.

Fig. 21.—Hindoo skull showing dentition in normal occlusion.

in gathering and harboring the wonderful collections. I must also express considerable gratitude to the men connected with those institutions for the readiness and willingness with which they assisted me in the investigation conducted there. Special mention must be made of the kindness shown me by Dr. Hrdlicka, Dr. Miller of the U. S. National Museum; and to Dr. Wm. K. Gregory of the American Museum of Natural History for the keen interest he is taking in all matters pertaining to teeth.



D.—Occlusal view of upper arch showing considerable difference in form from that of the lower arch.



E.—Occlusal view of lower dental arch, showing its variability in form from that of the upper.

Fig. 21.—Hindoo skull showing dentition in normal occlusion.

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*A.*—Anterior view showing moderate overbite of incisors.



*B.*—Right side showing normal relation of buccal teeth.

Fig. 22.—European White Skull showing normal occlusion.



C.—Left side showing normal relation of buccal teeth.



D.—Occlusal view showing difference in curve of the two dental arches.

Fig. 22.—European White Skull showing normal occlusion.



*A.*—Anterior view showing moderate overbite of incisors.



*B.*—Right side showing normal relation of buccal teeth.

Fig. 22.—European White Skull showing normal occlusion.



C.—Left side showing normal relation of buccal teeth.



D.—Occlusal view showing difference in curve of the two dental arches.

Fig. 22.—European White Skull showing normal occlusion.



## DISCUSSION

*Dr. Martin Dewey, Chicago.*—Mr. President and Members: I am very glad to discuss this paper for several reasons. First, because I am not going to apologize to you for not having seen the paper in order to discuss it. Second, because the title of this paper, "Dimensions Versus Form in Teeth and Their Bearing on the Morphology of the Dental Arch" is a subject which has been written about considerably in the last few years.

As Dr. Hellman mentioned, several attempts have been made by measuring the teeth to predetermine the shape of the dental arch. All of these various plans have a good many points that are similar, and about all one can say for these attempts is this: that they are simply taking certain types or certain skulls and following out an average. There



Fig. 1.

is nothing, as the doctor has shown you, scientific about it, and about two years ago in a discussion with one of the foremost men in dental engineering, I asked him the question, can you do this with any skull or animal? If you can scientifically predetermine the dental occlusion in man, you can do it in animals. He contended that he could do it, but I believe it can not be done because the teeth vary so much as regards arch form.

Dr. Hellman has shown a series of forms of arches in anthropoids, and in order to more fully substantiate or prove the fact that the shape or dimensions of the teeth have very little or nothing to do with the form of the arches, I will go back several million years still further in evolution and show you some of the things nature attempted when she first started.

To again call your attention to some of the things I mentioned this morning, you must keep in mind constantly the fact that function was used to play a great part in determining the shape of the dental arch as well as the supporting structures.

In this shark (Fig. 1), much like the opossum, we find another living fossil. You have one of the first attempts made towards the formation of a dental apparatus. There is absolutely no connection whatsoever, as you can see, between the tooth form, the diameter of the tooth, and the dimensions of the teeth and shape of the arch, because he has teeth with approximating surfaces which are conical and have existed there as a result of function and use on the part of nature. There is simply a bunch of placoid scales grown back from the oral cavity that are beginning to perform the primary function of prehension.

Passing on to another group, we find the result of function and use has changed the shapes of the teeth, until we find sharp cutting teeth in the upper arch and spear-shaped teeth in the lower arch for performing the functions of incision and prehension. The



Fig. 2.

lower teeth, which perform the function of prehension, are different in shape, and the whole thing is not a question of dimensions of teeth, but a question of the influence of function upon the parts.

Passing on to the prehensile and carnivorous type of teeth we find the premaxillary bone and maxilla has been elongated. We have a series of conical teeth (Fig. 2). You could not measure these cones and arrive at an idea of how the arch is shaped. If there is any scientific rule in measuring the arch it will work in one case as well as the other. Biology can not be worked out by mathematical formulæ as the doctor shows. You can not regulate teeth by mathematical rules or calculations. Unfortunately in man the dental arch has passed through the process of evolution until we have a certain shaped form approaching a circle or curve which you can seemingly measure, for anything that approaches a curve can be measured to a certain extent by rule. Anything that follows a

sphere can be studied in accordance with the law of average, but it may not have any bearing whatsoever. These measurements follow a certain variation, and this variation has some bearing on the question we are discussing.

Take this one case (Fig. 3) in the series where evolution has proceeded. This is one of the inferior reptiles. Here we have a series of conical teeth. If you measure one of these teeth you could not say how long or wide the arch would be (Fig. 3). The width of that was determined by function along with the evolutionary changes, and many factors were brought to bear on it at that time. I am showing these extremes to point out the fact that there is no law or rule whereby the dimensions of the teeth have anything to do with the shape of the arch. If it were a fact and had any biologic importance, it would work



Fig. 3.



Fig. 4.



Fig. 5.

in one animal as well as in another. You can not pick out man and make a biologic law for him that will not hold in the rest. If you have a biologic law that will apply to man, its application should be similar in animals.

The crocodiles and alligators have conical-shaped teeth, but nothing whatsoever will determine the shape of the arch. The teeth being conical makes necessary the function of prehension, and the muscles of mastication and the temporo-mandibular articulation are arranged in accordance with the function.

If we take the species of nonpoisonous and poisonous snakes which are closely re-

lated, we find a vast difference between the poisonous and nonpoisonous snakes occurs in the shape of the arch, in the anatomic structure of the arch because of the different functions of the teeth. In the nonpoisonous snakes (Fig. 4) the whole function is that of prehension and deglutition, and the maxillary and premaxillary bones are shaped accordingly. In the poisonous snakes we find the whole thing modified because the function of the poisonous fangs makes necessary modification of the premaxillary bones and modification of the temporo-mandibular articulation as well as a hinge-joint between the premaxilla and maxilla (Fig. 5). The shape of the fang has nothing to do with the arch form in the different species, but the function of each tooth has played a part as observed in animals. The reason some animals have existed and others have perished is that in the race of life the teeth have not evolved, or some part of the animal has evolved which has enabled him to live in the environment he was subjected to at that time.

Here is an illustration (Fig. 6) showing the typical conical teeth of the armadilla in which each cone has no relation to arch forms or dimensions of the teeth, and in fact, these teeth have got to the point where they are more or less rudimentary. The animal



Fig. 6.



Fig. 7.

can live without these teeth because the tongue and the roof of the mouth have usurped the function of the teeth, but they still exist as conical structures, and the arch form is influenced by the shape of the tongue, not by the teeth.

Figure 7 shows another extreme condition which we find in rodents. This is a rabbit. The molars and premolars are located back at the anterior end of the zygomatic arch. Then there has been extreme development in the anterior portion of the premaxillary bones until the incisors are set far forward. There has been an increase in length. The form of the tooth, not the dimensions of the tooth, has been to a great extent responsible for the shape in the arch, plus the function to which these teeth have been subjected. These teeth all grow from persistent germs, and consequently, if you take a radiogram of them you will find the roots of the upper central incisors have extended far back into the premaxillary bone which has elongated to accommodate them.

Leaving the incisors, we find not only tooth form is responsible for the shape of the arch, but it has been responsible for the special development of bone in the zygomatic cavity. You will notice that the zygomatic and orbital cavity are one common cavity (Fig. 8). There is a special development of bone which shows not only that the tooth form is responsible for the arch form, but that the extra development of bone to cover the end of the tooth is the result of form and function.

If you had the teeth of a rabbit and measured them, I do not think you would be able to make an arch anything like a rabbit's unless you had previously seen the rabbit.

Figure 9 is a radiogram of a squirrel, and the shape of the teeth influences the entire shape of the mandible. The tooth form determines the shape of the arch and the arch is not determined by the mesio-distal diameter of the tooth.

Coming to the herbivorous animals we will find the same thing is true. Function has made necessary the increase in the length of the mandible as well as in the premaxillary bones, on account of the use of certain classes of food. The width of the lower incisor again has nothing to do with the width of the molars. There is no relation that we can figure out. The shape of the arch has been dependent upon the shape of the teeth. The proximal contact has been so arranged that the teeth can perform the function of grinding. The upper teeth approximate or overlap each other on one side, and on the opposite side give support in the act of mastication.



Fig. 8.



Fig. 9.

Figure 10 shows that arrangement better. See how these teeth approximate on the buccal side and the lower approximate on the lingual side. The shape and function of the teeth have determined this, and the relation between the molars and incisors has nothing to do with the width whatsoever.

When we come to carnivorous animals we will find them to have passed through a series of evolutions. The carnivorous animal, owing to the shape of the canine, develops a different shaped mandible than other animals, proving the influence of the shape of the teeth not only acts upon the arch form but upon the muscles of mastication and the temporo-mandibular articulation.

There is very little else to say regarding the carnivorous animal except the small incisor which you see in Fig. 11. The very small diameter has nothing to do with the

width across the molars. There is no relation existing between the incisors and premolars mesio-distally which can be worked out as a law as you go from one class to the other, but we find tooth form controlled by function has been responsible for the development of the dental apparatus.

When we come to the kangaroo we will find another animal which destroys the whole scheme of mesio-distally measurement of the diameter of the teeth, because in the mandible we have two long incisor roots which extend anteriorly. The upper three incisors develop so that they occlude around the two lower ones and give an effective incising apparatus, and the molars and premolars have been shaped to perform the grinding

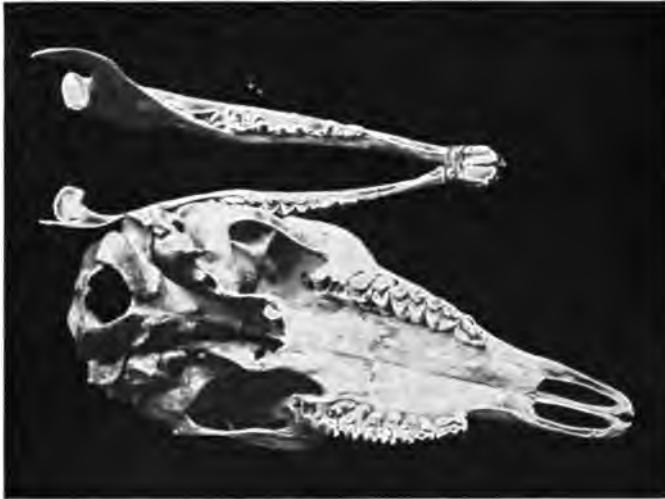


Fig. 10.



Fig. 11.

of the herbivorous diet, but the width of the arch depends upon the shape of the tooth and not upon the diameter of it.

Going back to the primates because Dr. Hellman has shown a large number of them, you will find you can not take any of the primates and construct a dental arch according to the prearranged plan worked out by several men. We have no established relations between the incisors and the width of the molar region.

Another thing which Dr. Lischer mentioned this morning in his paper was alluded to in a paper by Dr. Leon Williams a few years ago in which he claimed a relation existing

between the curve of the zygomatic arch and the curve of the molar and premolar regions. Probably he arrived at that conclusion the same as some have arrived at the conclusion that there is a certain relation existing between the width of the incisors and molars. He saw a few human skulls, and those few he saw happened to have the same curvature; but if there was any relation between the shape of the dental arch and the zygomatic arch in man, it would be the same in primates and other animals. We find in some a straight dental arch and quite a curve to the zygomatic arch. The reason the zygomatic arch takes that curve is that there is a great pull upon it by the muscles of mastication. If I showed you a rodent, you would find the zygomatic arch has a distinct shape because of the peculiar pull of the muscles of mastication. If you apply the same rules to the incisors and measure them with the molars, you would be away off.

Any rule which is carried out in man which does not hold true in the lower animals must be faulty, and the dimensions of the arch and the shape of the arch depend upon the shape of the teeth, and there is no correlation existing between the width of the incisors and the width across the molar region. There is practically no relation between the mesio-distal diameter of the incisors and molars, but it is the form and shape of the teeth, especially the shape of the dental arch, and not only the crown part, but the root, which play a great part as you have seen in our studies of the rodents.

*Dr. Milo Hellman, New York City.*—I intended to offer my apology for not having sent copies of my manuscript either to Dr. Dewey or to Dr. Bradley, and I do so now, as I realize they were at a great disadvantage in discussing the paper. I did not have my manuscript in a condition to furnish them with copies of it before presenting it to you.

*Dr. S. W. Bradley, Ottawa, Canada.*—Dr. Hellman need not apologize for not sending me a copy of his paper because I am quite sure if he had done so I would have failed to appear at the meeting till this paper had been read and discussed by other members. It is a timely paper, because I think some of us were being bothered a good deal by those papers of Mr. Stanton and those engineers who are trying to correct teeth according to mathematical formulæ. I started to read some of those papers, and when it came to the formulæ I stopped. I never did like algebraic formulæ anyway, and I gave the engineering principle up, and decided to do as well as I could without it.

Dr. Hellman's paper shows, I think, there is nothing constant in nature. We can not start along mathematical lines. I believe if the form and shape of the teeth are due to heredity, the shape of the arch is due to function and to nutrition.

I heard a splendid paper not long ago by Major Wells who is attached to the Canadian Army Dental Corps. He did a good deal of research work along the line of infant feeding and nutrition, and claimed that mother's milk was the only natural food for infants, and that these so-called artificial foods were a delusion and a snare. While the child seemed to develop from them and to grow, there was a tendency towards the development of rickets; nevertheless a great many children were brought up on artificial foods. He said the nearest food to mother's milk was warm cow's milk diluted and sweetened, and that is very hard to procure unless one lived on a farm.

He also performed some experiments with guinea pigs to show the effect of malnutrition on the teeth and surrounding tissues. He took a number of guinea pigs which were all healthy, and he killed one of them and made microscopic sections of the teeth in the jaw. He showed those teeth the night he read his paper to the members of the Ottawa Dental Society. Then he took some of the animals—I don't remember how many—and put them in boxes where they did not receive sufficient air or proper food for a time, and at the end of three weeks he killed some of these animals and made microscopic sections of their teeth and of the jaw, and these sections showed that the cancellous structure of the bone was not good at all, and showed further that the composition of the teeth had deteriorated. Then he took some of the animals that were ill-fed and ill-housed and put them back into sunlight; took proper care of them, and fed them on proper food and at the end of three weeks killed some of these, made sections of their teeth and the alveolar process and the result showed that the animals were as healthy as they were at the beginning of the period when they were badly housed and fed. Those experiments showed

very plainly that nutrition is the principal factor in developing bony tissue including the maxillary and mandibular processes.

There is one other point, I wish to speak of, and that is, in our practical work in connection with the cases that come to our office we can not go altogether by the form and shape of the teeth in predetermining the arch. We have to judge a great deal by the child's parents. If we could see those parents and then apply our observations to the patient we are to treat, we can doubtless learn a great deal. If we expect a patient to grow to be a tall person from the appearance of the child's parents we will have to shape our arch differently than if we expected the patient to be a square, stout person.

I finished two cases just recently, and one of them was a boy who was stout and squarely built, and his arches are a great deal wider and squarer than those of the other boy who was tall and thin. I do not think it would have been possible to have applied the rules of mathematics to these two cases, for the shapes and sizes of the teeth were very similar. I predetermined my arches from the appearance of the children's parents.

*Dr. Hellman (closing).*—I have nothing to add in addition to what I have already said other than to thank you for your kind indulgence in listening so attentively to my lengthy paper.



# THE CORRELATION OF RHINOLOGY AND ORTHODONTIA\*

BY E. W. ALEXANDER, M.D., SAN FRANCISCO, CAL.

FOR years I have been particularly interested in the correlation of systemic diseases with those of ophthalmology and rhinology. It has been interesting to observe that one of the really noteworthy features of the advance in the art of healing has been the organization of the so-called "Diagnostic Sections." This assembling of a number of specialists, covering the entire subject of medicine and surgery, for the consideration of cases submitted to them, with the idea that such a group, working together in a sympathetic way, doing their work preferably in a well-equipped hospital, will be able to add greatly to expeditious, accurate, and inexpensive diagnosis. The best known example of such a group is the Mayo brothers' organization but others are rapidly being formed throughout the country, and we have a very efficient one here in San Francisco. The benefit of such grouping is not all on the side of the patient, but is shared, in a very positive way, by the individuals composing the section, inasmuch as the knowledge gained in the correlation of signs and symptoms of the whole body with their own specialty greatly adds to the efficiency, comprehensiveness, and pleasure of their work.

So, at the outset, I bring to you my main contribution: propagate individually and collectively this association with general medicine, and by so doing establish a point of view which will lead to a greatly improved orthodontia.

The earliest development along these lines between the rhinologist and orthodontist naturally brought out certain mechanical problems. These you are well acquainted with, particularly the vicious circle of septal deviations, adenoids, tonsils and the high narrow arch. We all can call to mind striking examples of improvement of symptoms by breaking this chain of pathologic conditions.

Rhinology has now become a surgical specialty. The days of the "squirt gun specialist" are over. We have come to a situation where we can, in a large percentage of our cases, quickly decide, with the aid of the x-ray, what needs to be done for the alleviation of obstructions to nasal breathing or the eradication of infectious foci in the nose, sinuses, nasopharynx or throat; viz., surgery.

Too great enthusiasm in giving prognosis may lead the rhinologist to bitter disappointment with his operative work, however, if he has not taken into consideration the manifold reflex and systemic affections which have such a marked bearing on the physiology of the nose; and quite conspicuous among these is malocclusion of the teeth and poor and incorrect alveolar arch formation. Here we need your help, and I am afraid it will need some high explosives to drive the idea into some of our skulls.

On the other hand, there are certain practical points in our work which need constant reiteration for the orthodontist. A few of these are: *First*. The necessity of the correction of marked nasal deformity coincident with the use of appliances for widening the narrow arch. One can not, for instance, expect

\*Read before the Sixth Annual Meeting of the Pacific Coast Society of Orthodontists, San Francisco, Cal., May 13, 1919.

to correct a traumatic or developmental deviation of the septum, except in selected cases, by any procedure short of surgery. I imagine that if a septum is deviated by the upward growth of the maxilla as it forms the gothic arch, then it will, after its complete ossification in its pathologic shape, associated with spur formation, etc., act as a mechanical hindrance to your efforts to widen the arch because it will hold up the peak. This is particularly true in adults or young adults. Therefore it would seem rational in all such cases to first do a submucous resection of the cartilaginous and bony parts of the septum—this ought to be done in all such cases anyway as a cure of obstruction to breathing and as a preventive measure against sinus disease. Then the application of appliances will be unattended with opposing forces from above; and probably more permanent results will be derived from your work. Furthermore without the free passage of air, the health of the patient is impaired, and so, indirectly, the general and bony development.

*Second.* A still more important point is the absorption and swallowing of chronic pus discharge from the nasal accessory sinuses. Not infrequently parents of apparently healthy children will allow a serious sinusitis to develop, or an atrophic rhinitis, or one or more of the many pathologic conditions of a systemic nature, dismissing the symptoms with the explanation that "it is just one cold after another." The public is slowly being educated along these lines, and many now know how important it is to stop these infections before irreparable damage has been done. It is the duty of the orthodontist in charge of cases of chronic discharges from the nose, offensive odor of the breath, obstruction to nasal breathing, inflammation and hypertrophy of the tonsils or any nasopharyngeal disturbance of chronic nature, to call to the patient's or parents' attention the necessity of eradicating the menace to the general health, just as it is the duty of the ophthalmologist to insist on physical examination and treatment when he discovers unmistakable signs of high blood pressure or diabetes or any other systemic disease in the retina. Furthermore, I often wonder what the result must be in the production of pyorrhea and erosion and caries of the teeth by the presence of pus in the mouth which has come from the nose or nasopharynx, especially when mechanical appliances are being worn.

*Third.* Of particular interest to the rhinologist is the influence of perverted secretions from the endocrine or ductless glands on the nasal mucosa. It is well established, for instance, that administration of pituitary gland extract will clear up certain marked vasomotor disturbances, as illustrated by hay fever.

The association of these glands to the development of the individual and especially of the bones is well known, and it seems possible that by the administration of small doses, positive changes in the growth of the alveolar arch and dental structure might be attained, at any rate in an indirect way. Thus in cases which come under your observation where there is a tendency to the vasomotor disturbances in the nose, particularly if there is an apparent delay in the skeleton development and with other signs of glandular disturbance, it would be a good idea to have first a rhinologic examination to rule out local pathology, and then a careful consideration of signs and symptoms of deficient endocrine glandular secretion by an internist, with the idea of supplying the required

stimulus to the glands or of administering an extract of the glands to supplement their activity.

This is one of the most spectacular chapters of medicine and might be turned to good advantage by the orthodontist.

*Fourth.* A similar, and perhaps even more subtle, problem to us is the intense perversion of the physiologic action of the nose due to reflex action from more or less distant foci of infection and irritation. In this classification large numbers of cases of pathologic dentition undoubtedly fall; also it is almost impossible to differentiate between pain due to mechanical and infectious processes in the nose and that due to reflex causes incident to dentition. It is just here that we need your help for diagnosis and treatment.

In conclusion it must be said that no diagnostic section could be complete without an orthodontist, and that the orthodontist will find that the correlation of his specialty with general medicine will be the means of transforming his point of view most advantageously.

#### DISCUSSION

*Dr. B. Frank Gray, San Francisco, Cal.*—Dr. Alexander's plea that orthodontists cultivate an association with general medicine in the hope of establishing a point of view that may lead to an improvement in our work is interesting and is so logical that I am sure he will find most of the men of our specialty in agreement with him. We have, in fact, endeavored to do this for a good many years.

Nasal occlusion, with the coincident mouth breathing, has seemed a stumbling block to the orthodontist, and he has, of course, turned to the rhinologist for help. Beyond doubt the needed assistance has come at times, wholly or in part, but the number of cases wherein it has been long delayed, if not entirely lacking, has been conspicuous. Long since I came to the conclusion that although good, clean work was done by the rhinologist in the removal of so-called "adenoids" or in other surgical procedures, with the hope of restoring the normal respiratory functions, the results were uncertain. In other words our little patients continued their mouth breathing in spite of the best efforts of both the rhinologist and the orthodontists. Therefore it has seemed to me that "habit" plays a large part in the case. Even though ample space was made for the passage of air as in normal respiration, the perversion of function had become so thoroughly established through mechanical obstruction that mouth-breathing had finally become habitual.

So I have come to the point where I very often recognize it as a habit, having no existing pathologic cause. Proceeding upon this basis (which I believe is recognized as correct by the rhinologist), I have sought methods of correcting the mouth-breathing habit. Whether it be a bandage to hold the mouth closed, surgeon's plaster, or other devices, I do not know that any marked success has been achieved. Doubtless as the years go by and maturity is reached the force of the habit will have been spent, so will the good, corrective work in orthodontia have been irreparably damaged.

As to the influence of orthodontic treatment upon the development of the nose and accessory sinuses, it has been generally believed that this treatment justified itself. Because of the intimate relation of the nose and sinuses, the maxillary bones, alveolar process, and teeth, it would seem to require no argument to justify the expectation of benefits to be derived through the harmonious development of all these different parts. But if our hopes would not be disappointed, it would seem necessary that all such procedures be done during the developmental period of a child's life.

The doctor has suggested the operation on deviated septa due to the upward growth of the maxilla and which may be "a mechanical hindrance in widening the arch as it will 'hold up the peak.'" He believes this to be especially true of adults or young adults. Of course, we can move the teeth at practically any period of life, but we have learned enough to know it is a rather hazardous undertaking after the formative period is passed. It is

a matter of retention! There is little use undertaking a long and difficult operation unless we are reasonably sure of permanency of result.

As to glandular insufficiency, while the literature brings the subject frequently to our attention, I prefer it be discussed by those more informed than myself.

No doubt, sinus troubles are overlooked, as Dr. Alexander suggests. It would be indeed well if we were wholly alive to the diagnosis in such cases. Reference was made to the "perversion of physiologic action of the nose due to reflex action and distant foci of infection and irritation." And there was the further suggestion as to whether pathologic dentition may be due to this. It would appear there is ample field for study and investigation along these lines. Doubtless there has been too little done so far from which to form more than an opinion.

Dr. Alexander has paid more than usual attention to the work of the orthodontist I feel sure.

*Dr. Allen E. Scott, San Francisco, Cal.*—It was my pleasure to have a rather interesting experience along this line some years ago, although I did not get anything very positive and satisfying out of it. Dr. Bogue, of New York, advocates rapid expansion in certain cases. Having a case which I thought required fairly good expansion I placed an ordinary jackscrew across the mouth, and proceeded to apply pressure as fast as was consistent with the comfort and convenience of the patient. I took x-rays at the beginning and each week thereafter. In about six weeks or two months I had expanded the arch from one-half to five-eighths of an inch.

What I wished to determine was whether I was separating the superior maxillæ at the median line or merely producing bone growth. So far as I was able to determine there was no separation at the median line, but a generation of bone even at this extraordinarily fast rate of expansion. Dr. Stanton has taken a green skull and placed an enormous pressure on the arches and claims to have obtained no perceptible expansion. These facts I think have some bearing on Dr. Alexander's remarks.

Mouth-breathing, as I understand it, may be divided into two classes. We have those patients who breathe through the mouth as a result of the physical blocking of either the nose or pharynx, and those who are able to breathe through the nose, but breathe through the mouth simply as a habit. Mouth-breathing in some cases is not a habit. It often happens that it is a physical impossibility to breathe any other way than through the mouth. In my opinion I think that treatment of such cases should not be undertaken until the child can at least force air through the nostrils, which, of course, will seldom take place before surgical interference. I think most of us are inclined to attribute too much mouth-breathing to habit, and not enough to the physical blocking of the upper part of the respiratory tract.

*Dr. Robert Dunn, San Francisco, Cal.*—I do not believe that mouth-breathing and malocclusion of the teeth, where associated, is due in all cases to pathologic conditions of the nose and throat. In fact, I am of the opinion that in a large percentage of Class II and III cases, the primary cause will be found somewhere else, and that the pathologic condition of the nose and throat present is a resultant condition which, during the development of the malocclusion of the teeth, may be considered a contributing factor in intensifying it. We can not, therefore, in many cases look upon it as a primary cause. I think I can safely say that this question is definitely settled in the minds of the older students of orthodontia.

*Dr. Alexander.*—(*closing discussion*).—The question of mouth-breathing is a very complex one, inasmuch as it is associated with such subtle influences. Local pathologic conditions have been spoken of. Habit has been suggested, and to overcome habit great patience is required along the lines of suggestion, but it can also be remedied by courses of physical training and singing exercises. On the other hand, in some cases turgescence of the nasal mucosa, without mechanical deformity, blocks the nose, and is due to depletion of the nervous system incident to a general debility, or to disturbances of the function of the internal secretory glands, or to a neurosis of hereditary character.

Finally it must be said that, while each of our specialties can control local conditions in a majority of cases, there are not infrequent examples of cases where results are nil until the broader aspect of metabolism, nerve reflex, etc., is brought to bear.

## HISTORY OF ORTHODONTIA

(Continued from page 527, Vol. V.)

BY BERNHARD WOLF WEINBERGER, D.D.S., NEW YORK CITY

**D**R. ANGLE, in his first Presidential Address before the American Society of Orthodontists, speaking of "*Orthodontia as a Separate Science*" stated:—"It is that orthodontia is a great science by itself, with requirements in its study and practice so radically unlike that of other branches of dentistry that the two can never be profitably combined, either in study or practice. Each seriously handicaps the other and orthodontia naturally suffers most for the reason that it is wholly unlike other operations in dentistry. It is therefore least understood, least studied, and made secondary alike in dental colleges, in practice and in dental societies. Hence it is not unlikely to follow that in proportion as a dentist is successful in other operations of dentistry he will naturally be less successful in those of orthodontia, for in that same proportion he will have less inclination, less time, and less energy to devote to it. Few would think it advisable to combine the practice of rhinology with that of dentistry, and yet we believe the two could be far more easily, profitably and successfully combined than can orthodontia and dentistry proper. The fact is, orthodontia deals almost wholly with different tissues, principles and art problems from those treated in ordinary dentistry and is extremely exacting in its requirements, necessitating peculiar talent, energy, fitness and devotion to certain lines of study which are as unlike those of other branches of dentistry as are the instruments best adapted to the performance of operations in each.

"Another most important reason is that the science of dentistry has grown to such proportions as to embrace in its study so large a field that any one who attempts to master it all must be regarded as a mere smatterer. In fact it needs no argument to prove that all progress in the different branches of dentistry is in reality being made largely by those who are specializing.

"The ultimate separation of orthodontia from dentistry proper is natural and inevitable and the sooner it is encouraged and becomes firmly established, the better it will be for both and indefinitely better for humanity at large. Orthodontia offers ample opportunities for the brightest minds. Let each student of dentistry, after having acquired a thorough knowledge of the fundamental principles of the science, select such lines as are best suited to his aptitude and liking and confine his energies to his selection and the result can not fail to be vastly more beneficial than the plan now followed. As yet there have been only a few men who have had the courage to completely specialize the practice of orthodontia, but the results of the efforts of even those few have been truly remarkable. Orthodontia has been revolutionized, and we would ask those who may doubt the practicability of this specialization of orthodontia to but reflect on the marvelous advancement which has been made in the various branches of medicine through specialization, not to mention the growth of nearly every other branch of science and art accomplished by the same power. Indeed this is the very age of specialization, and was there ever such an age of progress? Wise is he who

recognizes the natural and resistless power of specialization, and narrow indeed must he be who is blind to its demands and attempts to resist its might.

"To hope that all this may be brought about at once, or even in several years, would be expecting too much. Great and radical changes must be wrought slowly. We must remember that each specialty in medicine has developed slowly and has become firmly established only after a considerable lapse of time and after many trials—ofttimes in spite of the keenest opposition—yet we can point with pride to the career of the late *Dr. Thomas Rumbold* of this city, whom several of us were proud to have the honor of calling friend. He was the father of rhinology and lived to see it firmly established as an indispensable specialty in medicine."

"*Some Basic Principles in Orthodontia*," *International Dental Journal*, page 729, 1903.

"I shall try this evening to make clear some principles which seem to me basic, and on the intelligent comprehension and application of which depend the possibilities of successful achievement.

"First, I shall hope to demonstrate to you that we must consider the dental apparatus as a whole in each case, together with the throat and nose and facial lines, instead of limiting our attention to local symptoms in the form of one or more crooked teeth, as has long been the practice.

"Secondly, I shall try to impress you from the orthodontist's standpoint, with the value of each individual tooth and with the absolute necessity of preserving the full complement of teeth, or its equivalent, in every case. I shall try to bring conclusive evidence that the sacrifice of teeth for either the intended prevention or correction of malocclusion is not only wrong practice and fallacious teaching, but most baneful in its results. I shall further try to show that the full complement of teeth is necessary to establish the most pleasing harmony of the facial lines.

"Thirdly, I shall try to prove to you that the first molars are the most important of the teeth, and that they are the first to be considered, from the orthodontist's standpoint, in both diagnosis and treatment; that we must first look to their correct adjustment instead of beginning with the incisors and ignoring the positions of the molars, or attempting to correct them last.

"Fourthly, it is positively essential that each arch and the teeth of each arch shall receive at least equal care in their adjustment, the preference, if any, being given to the lower.

"And lastly, I shall try to show you that fully ninety per cent of the regulating appliances represented in our literature are constructed and operated upon incorrect principles.

"I shall not have time to touch upon the etiology of malocclusion, but I feel that I should not miss this opportunity to say that I believe it is as ignorant as it is cruel to brand as degenerates those suffering from malocclusion of the teeth.

"I hope I shall this evening awaken much interest, and if we do not agree on some points it will not be the first time that men have differed on the subject of orthodontia, yet I hope and believe that our differences will be honest.

"Normal occlusion is maintained only through the normal relations of the

inclined planes of the cusps, assisted by the normal influence of the muscles externally and internally upon the crowns of the teeth.

"There are two points of great importance in the occlusion that I also wish you to remember. First, the normal relations of the first molars, and second, that of the cuspids. The first determines the mesio-distal relations of both lateral halves of the arches; the second, the width of the arches. If the first molars lock normally, as you see in this picture, the mesio-buccal cusp of the upper will occlude in the buccal groove between the mesio- and disto-buccal cusps of the lower. And if the first molars are so locked in their eruption it will make possible the normal eruption of all the teeth both anterior and posterior to them, as has resulted and is here shown in this beautiful picture. But if the first molars lock mesially to normal, or distally to normal, in their eruption, it will necessitate the eruption into positions of malocclusion of all the remaining teeth both anterior and posterior to them, and according as these molars erupt and lock in mesial or distal relations, in one of the lateral halves of the arches, or both, will be determined certain classes of malocclusion which will be considered later.

"Now, if the locking of these molars plays so important a part in the eruption and positions of the remaining teeth, can you not see how important it is that they be preserved and early attention given to their eruption and relations? Hence the time for beginning treatment of malocclusion is no longer mythical, but as fixed and well-defined as the first molars themselves.

"It must be borne in mind, however, that even with the normal locking of the first molars and normal mesio-distal relations of the jaws and arches, the normal locking of all the other teeth is by no means assured, and malocclusion may involve any or all of the teeth anterior to them, but usually is chiefly confined to the narrowing of the arches in the region of the cuspid, with bunching of the incisors, similar to the case first illustrated, and, as we have said, by far the largest number of cases of malocclusion belong to this class, and it is to this great class we will first direct our attention.

"Before leaving this picture let me try to impress you with the importance and wonderful relations of the occlusal planes, how they must gain their normal relations if we would hope to be successful in maintaining them in the positions in which we wish them to remain after correction. And what a waste of time to consider one arch without the other, or to attempt to ignore the importance that each tooth bears to all other teeth in both arches. Or, in other words, this picture of normal occlusion and all that it means must actuate and direct all of our efforts from the beginning of treatment to the termination of retention.

"In the treatment of these cases I believe I can again prove to you that my theory is correct, that extraction is wrong, that the full complement of the teeth is necessary to the best results, and that each tooth shall be made to assume its correct relation with its fellows. In other words, if the molars and premolars of the upper dental arch be moved distally one-half the width of the cusp of a molar, or premolars of the lower arch be tipped forward in their alveoli to the same extent, or one-half the width of a cusp of a molar or premolar, there will then be normal mesio-distal relations of these teeth, and if the arches in the region of the incisors be put in true at the same time, there will be harmony in their

relations and the best effect will have been produced upon the facial lines. In other words, we will have established normal occlusion with all its possible benefits.

"This plan of treatment I have been practising now but three years, and so pleased am I with it in the large number of cases that I have so treated that I no longer practise or believe in the plans that I formerly advocated, or that of gaining harmony in the sizes of the arches by the sacrifice of the two first premolars in the upper arch and retracting the cuspids and incisors to close the spaces, or by the plan known as 'jumping the bite,' first advocated by my friend, *Dr. Kingsley*, consisting of first placing the teeth of each arch in correct alignment and then compelling closure of the mandible forward the width of one premolar tooth on each side, so that all of the teeth were in normal occlusion. That both of these plans may have been more or less successfully followed there can be no doubt, but I believe them to be far more tedious, more difficult of accomplishment, and more uncertain as to satisfactory results than the plan I now follow.

"Now, as to treatment. The upper molars and premolars were moved distally and the lowers mesially until they were in normal occlusion, as shown in the next picture. You will see that each occlusal plane is in normal relation with its opposing occlusal plane, thus locking and assisting in its retention, and I assure you that the facial lines were as greatly improved as was the occlusion.

"And how was this accomplished? you will naturally ask, for you must justly reason that to move all of the teeth in both arches, as has been done, certainly would require a considerable degree of force, and that it should be directed in the right direction.

"I formerly advocated a few combinations of appliances which I have now largely abandoned. I believe the headgear and chin retractor were valuable. The latter is now entirely obsolete in my practice and the former but rarely used, and the same might be said of the traction screw and rotating levers. The jackscrew has been and doubtless will long continue to be the one form of regulating appliance most used by dentists, for it seems almost impossible to get dentists to study occlusion, its bearing upon and importance to orthodontia, but they can and do reason only from the basis of the mere symptoms, or 'crooked teeth,' as they call them, and they naturally reason that a jackscrew placed against a tooth that seems to be 'straight' and made to operate at its other end against one that is 'crooked,' to push it into a better position, is the one thing needful, but I believe the jackscrew to be one of the poorest of regulating appliances, and I say this notwithstanding that I am the inventor of what I believe to be the most simple and efficient one yet brought out, and one that has more base imitations than any other of my inventions. But I now think the principle is wrong with the jackscrew, as it is with all these forms of appliances that are made to act locally, so to speak, or upon only the teeth that seem 'crooked,' instead of one that should become operative from the basis of occlusion, having control of one or of all the teeth of not only one but of both arches, if need be. I can not bring out the point too forcibly that it should be our mission to improve the dental apparatus as a whole through occlusion, for in this way only can our efforts be fruitful of the best results in not only bettering the principal function of the teeth,—



mastication,—but their appearance, as well as giving greater freedom to the movements of the tongue, and also making possible the modification of the vault of the arch towards the more normal growth and development of the nasal tract, and last, but of great importance, a better contour of the face with more pleasing lines of facial expression.

"I am now accomplishing fully 98 per cent of the tooth movements in my practice with but a single appliance, and performing them far easier and more quickly than I ever did with all the various combinations I have ever advocated in the past, which at most were only very few, for it has ever been my aim to simplify both the diagnosis and treatment of cases in my practice, and all of the cases you will see on this screen tonight have been treated with but one appliance,—namely, the expansion arch,—and although I believe that I have added some valuable improvements to it, yet it was known and used before this Republic was. It was first used by that greatest of the early dentists, the Frenchman *Fauchard*.

"The next picture (Fig. 30) [Fig. 1] shows it as I now use it. In temper it contains much spring, sufficient to speedily widen the dental arch, if need be, and having self-locking nuts to properly adjust it to the demands of expansion. It is

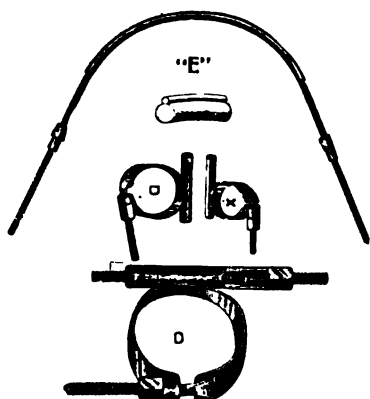


Fig. 1.

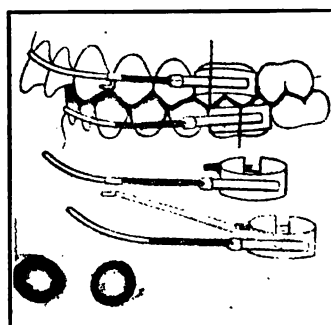


Fig. 2.

round instead of being half-round or flat, as used by the older writers, which better prevents the accumulation of food, as well as making it more compact and less conspicuous. My latest improvement to it is a delicate rib on the periphery of the inthreaded portion. This is to be notched at desired points to prevent the slipping of wire ligatures, this form of ligature being not only a very valuable addition to orthodontia, but making this wonderful appliance vastly more efficient. I have called it wonderful, and truly it is, and he who intelligently experiments with it will grow daily more and more impressed with its great possibilities in correcting malocclusion. In my opinion there is no tooth movement, be it simple or complicated, that can not be performed more quickly and easily with this than with any other device, and I have arrived at this conclusion not hastily, but gradually, and one by one have abandoned nearly all of the other once favored appliances.

"I wish we might spend much more time on this picture, but I have carefully described it in other writings, and must hasten to other pictures, only

stopping here to say that in all cases belonging to the first class, if we have used this appliance intelligently and have adjusted each tooth in each arch, the arches and the occlusal planes will then be in harmony, and if the teeth are in distal occlusion, as in the case considered but a few moments ago, the lower teeth may be easily shifted mesially and the upper teeth distally into harmony of occlusion, it only being necessary to use two of the expansion arches, and reciprocating the force from one to another, as shown in the next picture (Fig. 31) [Fig. 2], the force being derived from one or more delicate rubber ligatures made to engage the distal ends of the tubes of the bands on the anchor teeth of the lower arch, and sheath-hooks which have been attached at desired points to the upper expansion arch. By studying this picture carefully you will see that force is exerted in the exact direction it is needed, and at the same time most inconspicuously and with very little inconvenience to the patient.

"Now, I know that when anything new and valuable is brought out in dentistry there is usually that familiar type of individual who will rise up and say, 'Why, I have been using that for twenty-five years,' but to my mind this savors of 'degeneracy.' The fact is, to the best of my knowledge and belief we are indebted to *Dr. H. A. Baker*<sup>1</sup> of Boston, for this idea, he having used it in the retraction of the protruding incisors of his son a number of years ago, and it was from him I received the idea. I have hence called it the '*Baker Anchorage*,' and it has almost revolutionized my daily practice. In its use, however, I would add this important improvement,—that the force be directed upon the molars first, instead of on the incisors, their positions being, as I believe, merely the result of the malpositions of the molars, and we should unravel the complexities of these cases by beginning right, that is, with the molars, following with the premolars, and lastly adjusting the incisors. And using it as here shown the force is directly received upon the first molars, pushing the upper distally and pulling the lowers mesially. Of course, all the lower teeth, as here shown, will be carried forward, and all the force required in their movement will be pitted against the upper first molars. As these move distally (the nuts being occasionally tightened), more or less space will be noted between them and the second premolars, and after the molars have been carried well back into correct positions the anchor bands should be removed and similar smaller bands (X-bands) placed upon the second premolars and the expansion arch again applied. Wire ligatures are also made to engage both first and second premolars on each side, and force from the rubber ligatures again exerted. After the premolars are well back into position the nuts in front of the tubes on the anchor teeth are loosened, or removed entirely, allowing the force of the rubber ligatures to be received upon the incisors through the centre of the arch. In this way the incisors, if they be prominent, are soon retracted.

"Of course, it is of the utmost importance that the teeth shall be mechanically retained in their new positions. The real retaining devices are the inclined occlusal planes, but these must be assisted for a time by a mechanical device, or of course the teeth that have been moved will speedily revert to their original

<sup>1</sup>Since giving the above address I have learned that *Dr. Calvin S. Case*, of Chicago, also employed this form of anchorage, probably at about the same time as *Dr. Baker*. It is reported in the *Transactions of the Columbian Dental Congress*, 1903.

positions, and the next picture (Fig. 32) [Fig. 3] will show you a simple device for holding the teeth that have been moved mesially in the upper arch in normal relations. I have been using this with much success for a long time. At first I used a spur cemented into a tooth, but later attached the spurs to accurately fitted clamp-bands, the spur being made to close in front of a metal plane attached to a band upon an opposing tooth, as you now see them. They may be used either upon molars or premolars. The bands must be accurately fitted and carefully cemented, and the plane and spur correctly placed. If this be properly done they will last as long as desired. I have had them remain in position two years without loosening, but unless they are properly adjusted they will give trouble, the one usually giving way being the spurred band.

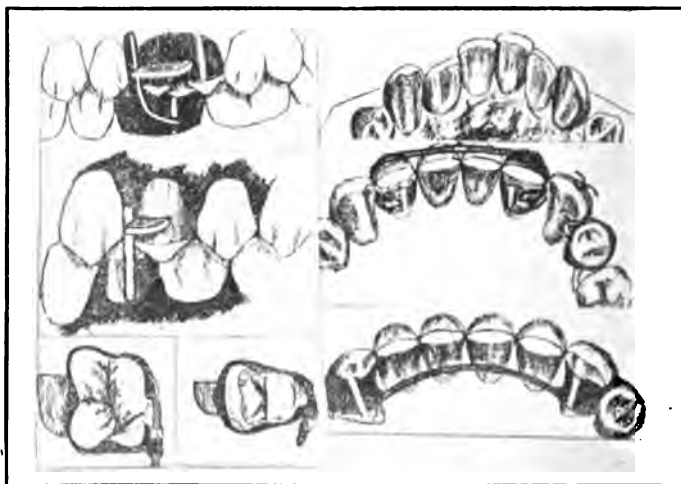


Fig. 3.

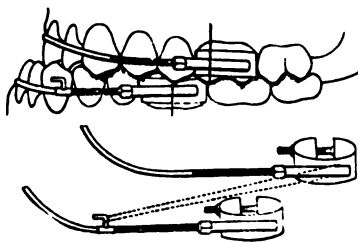


Fig. 4.

"The other devices shown in the cut are for the retention of incisors and cuspids, and are so well known that I will not take up your time here with an explanation of them.

"The plan of treatment was the same as that described for cases belonging to Class 2, only, of course, the direction of force was reversed, as shown in Fig. 33 [Fig. 4].

"In conclusion, let me say I have touched but a few of what seem to me the important places in orthodontia. Each class, division, and subdivision is ample for a full evening's discussion but if I have awakened a higher appreciation of occlusion and convinced you that the first molar tooth is not only first

in importance but first to correct if in malposition, I will have accomplished much but no less than if you have been brought to realize that the hasty, ruthless sacrifice of teeth for the correction or prevention of malocclusion is as barbarous and unscientific as it is disastrous in its results. If I have done this I shall always feel that my mission to this society has been an enjoyable and fruitful one."

Before the Fourth Annual Meeting of the American Society of Orthodontists, 1905, *Dr. Angle* in speaking of the "*Upper First Molar as a Basis of Diagnosis in Orthodontia*" treated the subject of the importance of diagnosis. He states:—

"If, then, diagnosis involves such responsibilities, what extreme care should the orthodontist give to it! How eagerly should he grasp every particle of knowledge that can give him light toward correct, intelligent diagnosis!

"Yet, notwithstanding that we still have 'guessers' and 'guessing' and 'odontocides' linked together, one and inseparable, who juggle terms and meanings and furnish lots of evidence which won't bear sifting to explain the 'guessing,' with carefully devised loopholes as to meanings and dates and assertions, and will doubtless continue to have such with us for a long time to come; yet, I say, notwithstanding all this, we do have a simple principle to guide us to a correct, intelligent decision in diagnosis, which diagnosis is always a sure clue to a correct line of treatment, even to retention. A principle, too, which eliminates 'guessing,' is antipodal to both 'guessers' and 'guessing.' It is a principle, too, so simple that experts are not needed to understand and interpret it, but any sincere student, no matter how humble, with intelligence enough to master the English alphabet can understand this principle and apply it successfully in diagnosis, and this principle applies to every case of malocclusion in existence in a human denture today, or that ever did exist. Indeed, every case of malocclusion carries with it this principle which is a key to its own solution, its correct diagnosis, and that key is the key to occlusion—the first permanent molars, or more particularly, as I shall show you later, the *upper first permanent molars*. I repeat that this key is not for the 'guesser' or the would-be improver of God's laws, but for the student of occlusion—the interpreter of Nature's great law in the human denture.

"To the members of the new school of orthodontia this key is familiar and in daily, yes, hourly, use, and its great value attested, so that to you little need be here said. Yet in connection with it there are some points which I shall present that may be of interest to you, for, recently, in the preparation of the MS. for another edition of my book I have gone over the entire subject of orthodontia, reasoning and weighing as carefully as I could all the points bearing on its various phases, and I believe that I can offer a few additional proofs why the upper first molar is the correct basis for diagnosis.

"Let us study somewhat carefully this kind of teeth which we have designated the 'key of occlusion.' Before the first molar erupts it is preceded by the completed denture of the child, which has developed normally under the most favorable conditions, for the food and habits of the child have been very simple and normal, with practically no pathologic conditions sufficiently grave to prevent Nature from carrying out her plan of the normal in building the denture.

So the deciduous teeth almost always erupt into ideal normal occlusion and the child denture is not only perfect in form, in part and in whole, but in location with the rest of the face and head, so that there is beauty, harmony and the highest efficiency. *Dr. Anema* has well said in connection with this thought, that the reason children's faces are in such perfect balance is because their teeth are in normal occlusion.

"So, when the first molars erupt, they do so under the most favorable conditions, unhampered by predecessors or by those teeth anterior or posterior to them, the jaws having been lengthening for years for their coming, and instead of being in any way hindered in their eruption they are, on the contrary, *guided into and guarded in* normal position by the beautiful, normally built child denture anterior to them.

"The first molars have the largest crowns, best defined cusps, largest roots and strongest attachments to the alveolar process of any of the permanent teeth, and owing to their great size and their position in the jaws they are chief in the function of mastication. As the first molars are planted in the alveolar process long years before the permanent teeth, anterior and posterior, shall take their place in the line of occlusion, they have become very firm of attachment; so by their size and strength they can and do act as dictators of these teeth and indirectly of all the other permanent teeth as they take their respective positions in the line of occlusion at their respective times. They also act as wise ruler, determining by their own length the length of bite, and in this way, in no small degree, decide the length of the face and the art relations, which, in importance, is best illustrated, and in a striking manner, by what the face misses in after years when these teeth are sacrificed, allowing the settling together of the jaws and shortening of the face, with consequent inharmony of facial lines, always so noticeable, and their wise control of the normal mesio-distal relations of the jaws by the locking of their well defined cusps is a factor in the growth and development of the face and jaws of mighty importance.

"Up to the time of the coming of these teeth this important office was performed by the locking of the entire number of deciduous teeth, whose efficiency has been gradually lessened by the wearing away of their cusps and the otherwise weakening of these teeth by the absorption of their roots, but after the eruption of the four first permanent molars they must be not only the principal supports of the jaws and the controller of their lateral as well as mesio-distal relations for years, but on them, also, must fall almost wholly the burden of mastication. I wonder how many of you comprehend and appreciate the important responsibility that the first molars assume in controlling the relation of the jaws, mesially and distally, as well as buccally, which has been transferred to them by the wearing smooth of the cusps of the deciduous teeth. Little indeed can be the assistance given by the permanent incisors during or even after their eruption, toward controlling the normal mesio-distal relations of the jaws, but if out of their normal positions they may and often do act as hindrances instead of helpmeets. Not until long years after the eruption of the first molars do they receive support and assistance from their weaker brothers, the premolars, and not until they have faithfully borne the great burden and responsibility dur-

ing the most trying period in the growth of the denture for six long years do they receive that real support from the second molars which it would seem they have so long needed; but by this time the great structure is practically completed, there only remaining to be added the tardy, erratic and very important last members of the family, the third molars.

"So far in what I have said relating to the first molar, the upper and lower have been regarded as of equal importance, as they should be, for in function of mastication they are equal, as well as in influence upon the rest of the dental apparatus during its growth and development, and they should be of equal importance in diagnosis, *but only when they succeed in locking normally* in their mesiodistal relations. But owing to the fact that the lower molar is dependent upon the caprices of the migratory mandible, it is in consequence less reliable than its sturdy, though somewhat smaller, but far more steadfast antagonist. For this reason the upper first molar becomes the true basis of diagnosis."

In 1908, *Dr. Angle* before the Alumni Society of the Angle School of Orthodontia, brought forward the question of "*Bone Growing*" *Dental Cosmos*, 1910. In this paper he introduced the "*Working Retainer*" the method that later developed into the "*Pin and Tube Appliance*."

"Doubtless you will be surprised at the title of my paper, and you will ask what *Bone-Growing* has to do with orthodontia. My answer is that it is probably the most important problem in orthodontic treatment. Indeed, most of our successes in treatment depend on our success in bone-growing, and if the orthodontist does not succeed in growing bone he will find, in time, that the teeth he has moved so dextrously and satisfactorily have all returned to, or very nearly to, their original positions. For this reason the branch of science which *Dr. Noyes* teaches us, histology, when it is understood and its relation to orthodontia really comprehended, will probably be accepted as the most important of any subject in the orthodontic curriculum, because it has so largely to do with the science of *Bone-Growing*.

"Let us remember that malocclusion of the teeth is always associated with a lack in the growth of bone, or the perverted growth of bone, in degree corresponding exactly with the degree of malocclusion. Nature attempts to build a denture, a face, a skull, and all other parts of the anatomy to be in accordance throughout with a type she has designed for the individual; but for some reason some of her processes in the building of the different parts may have been interfered with. The result, as we find it, is perversion or arrest in the growth of the alveolar process, jaws, and associate bones, and malocclusion."

#### THE "WORKING RETAINER"

"With a view of expediting the treatment of malocclusion by shortening the period of retention in these cases, the writer has devised a method of retention by which he believes the cells involved in these tissue changes will be gently stimulated to greater and longer activity, with the more speedy and complete development of the tissues.

"The device has for its purpose not only to support the crowns of the teeth in their corrected relations with the line of occlusion, but at the same time to exert a very gentle but constant force labially on the roots of the incisors. It

may be regarded as a '*Working Retainer*,' as appropriately named by a former student of the writer, *Dr. Geo. B. Palmer*.

"The device is made by removing the segment between the threaded ends of the expansion arch that had been employed in accomplishing the movement of the teeth, and substituting for it a segment, of the same length and curve, of very delicate and elastic irido-platinum and gold wire, twenty-nine thousandths of an inch in diameter, attaching the ends of this wire to the threaded ends of the original arch with twenty-two karat gold solder. Very small tubes are soldered perpendicularly to the labial surfaces of delicate irido-platinum bands previously very carefully fitted to the crowns of the incisors. These tubes must be parallel with each other, their incisal ends resting in contact with the middle segment of the arch.

"Very delicate spurs, of the length and diameter of the bore of the tubes, or twenty-two thousandths of an inch, are soldered to the arch at points opposite the mouths of the tubes when the arch is in position. The ends of the spurs are then gently inclined forward about three thirty-seconds of an inch by bending, the arch replaced upon the teeth, and the spurs sprung into the tubes. Thus a gentle force from the elasticity of the spurs and arch combined is given stationary support in all directions."

Again before the Alumni Society of the Angle School of Orthodontia, September, 1911, *Dr. Angle* gave to orthodontia his method of "*Root Movement of Teeth*."

"Instead of tipping the crowns of the teeth into the line of occlusion and leaving the roots at abnormal angles of inclination, to be adjusted by nature during the period of retention, the teeth should be moved bodily, as a result of force so gentle and so evenly distributed as to stimulate normal cellular activity and the growth of bone." This was known as the "*Pin and Tube Appliance*" "*Evolution of Orthodontia—Recent Developments, Dental Cosmos, page 853, August 1912.*"

#### "BONE-GROWING" AND THE "WORKING RETAINER"

"It then occurred to the writer that the retaining device should, if possible, be so constructed as to operate not only for the support of the crowns of the teeth in their corrected positions, but also to exert gentle pressure outward on their roots, and thus assist nature by stimulating the osseous cellular activity to more rapid, complete, and normal development of the bone.

"The working retainer, which was carefully described and illustrated on page 265 of the March, 1910, issue of the *Dental Cosmos*, and which we would request the reader to review carefully, was the result, and so successful was this method of retention that it has become an accepted practice and is recognized as a factor of much value, as with it far quicker and better results are gained in many cases than were possible before especially, as we have said in the article above referred to, in those cases where the most active period in the development of bone had passed.

"From this step the writer reasoned that our very plan of treatment might be greatly improved; instead of tipping the crowns of the teeth into the line of occlusion and leaving the roots at abnormal angles of inclination, to be adjusted

by nature during the period of retention, the teeth should be moved bodily, *as a result of force so gentle and so evenly distributed as to stimulate normal cellular activity and the growth of bone.* In other words, the work of the orthodontist should be the intelligent assisting of nature in her process of development bone, thus making it possible for her to normally build the denture in its entirety. When the proper assistance has been rendered and the normal growth and development of the bone and other tissues accomplished, all other conditions being favorable, the work of the orthodontist should be at an end, thus eliminating entirely the usual tedious period of retention, with its attendant difficulties and annoyances.

"That tooth movement is performed more easily, more satisfactorily, and with better results when very gentle pressure, rather than pronounced force is employed, has for a number of years been becoming more and more apparent to the writer, and the correctness of this belief has now been abundantly proved by the recent remarkable research work of *Dr. Albin Oppenheim* of Vienna, in his elaborate experiments in moving the teeth of monkeys. These experiments were fully reported in a course of lectures by *Dr. Oppenheim* at the session, just closed, at the Angle School of Orthodontia; a report of these investigations will

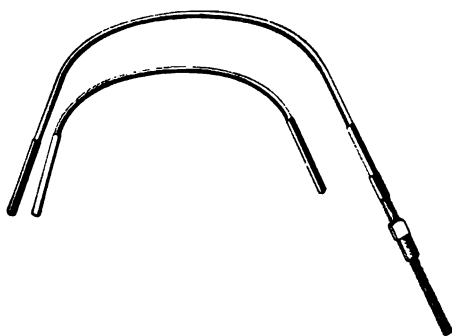


Fig. 5.

soon be published in this country, and should awaken the greatest interest, especially among histologists and orthodontists.

#### AN IMPROVED FORM OF EXPANSION ARCH

"Experiments made by the writer, covering a period of four years, have resulted in the production of appliances for accomplishing tooth movement in accordance with the plan above suggested. These appliances consist of an expansion arch of further modified form, with auxiliaries and attachments. Fig. 34 [Fig. 5] shows the modified arch. It will be seen that it is divided into three parts, a middle section and two ended sections. The end sections are threaded and provided with friction-sleeve nuts. The middle section is smooth, with square ends, which accurately telescope for a distance of about one-eighth in square sockets in the anterior ends of the threaded sections. One of the advantages of this form of arch is that the middle section may be of any length or diameter desired, and as a result of many measurements of models, three length and three diameters of each length are found to amply provide a most convenient range of size and strength for all dentures, from the smallest to the largest, thus fully meeting all requirements in practice. All middle sections, of whatever length or diameter,



are accurately interchangeable with the threaded sections, which are of the same diameter as the threaded portions of the writer's standard expansion arch E, the friction-sleeve nuts being adapted to the writer's standard D bands.

"The three diameters of the middle section are forty-five thousandths of an inch, thirty-eight thousandths of an inch, and thirty thousandths of an inch (.045", .038" and .030"). The arches of heavier diameters, that is .045" and .038", are intended to be used in connection with wire ligatures in precisely the same way as the standard expansion arch E, which has so long been familiar to all. These heavier middle sections are made in both precious metal and nickel-silver, as are also the threaded sections.

#### THE .030" DIAMETER ARCH AND ITS APPLICATION

"To those already familiar with the expansion arch E, any further description of the larger diameters of the middle sections of the new arch in regard to their use in connection with the clamp bands, wire ligatures, etc., seems unnecessary; the use of the two forms of appliance and the manner of their operation is identical, but the greater convenience of the new form readily suggests itself. The manner of using the delicate arches of .030" diameter, however, is unique, and the plan of operation radically different from that for the arches of heavier sizes just described, and it is by the use of this delicate arch only that the movement of the teeth bodily, *i.e.*, of the roots as well as the crowns through the stimulation of bone-growth, is possible. It is made of precious metal only, for reasons which will be given later. In its use, wire and all other forms of liga-



Fig. 6.

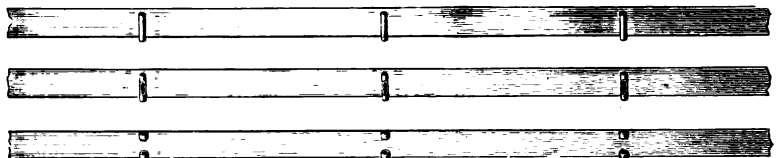


Fig. 7.

ture are dispensed with, the attachments of the arch to the teeth to be moved being accomplished by means of delicate pins (Fig. 35) [Fig. 6] soldered directly to the arch, which engage very delicate tubes (Figs. 35 and 36) [Figs. 6 and 7] soldered to bands upon the teeth to be moved, insuring the most firm and compact attachment with practically no loss of power by stretching or displacement, and with perfect control over the direction and distribution of force, not only upon the crowns of the teeth to be moved, but simultaneously upon their roots as well.

"These very delicate pins, tubes, and arches are carefully proportioned and most accurately made on special machinery. The pins closely telescope the delicate tubes, which are of uniform length, diameter, and bore. One end of the pin is made in the form of a hook, which accurately fits the bevel of the end of the tube when the pin is in place in the tube. It is of the greatest importance that this hook shall not be dulled and thus rendered ineffective. The orthodontist should study its proper locking and unlocking, to avoid injuring it. The other end of the pin has the form of a minute fishtail, with a knife-edge crescent for convenience in attaching the pin to the arch with solder. A portion of the outer

wall of some of the tubes is seen in Fig. 35, to be cut away in crescent form. This is not necessary, but will often serve as a convenience by giving access to the pin for its bending without wholly removing it from the tube.

"*Mode of Applying Arch in a Typical Case Belonging to Class 1.* In the following we shall describe the adjustment and operation of the new appliance for the treatment of a well-defined, typical case belonging to class 1 (writer's classification), a model of the upper jaw of which is shown in Fig. 37 [Fig. 8]."

It will be impossible to describe the adjustment of the appliance in this history, on account of the length, but by referring to the original article those interested will find a detailed description of same.

On account of certain defects in the handling of his previous appliances Dr. Angle before the same Society the next year (1912) described a better method of adjusting the tubes, etc., in order to bring about root movements. "*Further Steps in the Progress of Orthodontia*" in the *Dental Cosmos*, January, 1913.

"At our meeting one year ago, as you will recall, I presented a new plan of treatment of malocclusion of the teeth, with new forms of appliances for accomplishing the various tooth movements in accordance with this plan, a de-



Fig. 8.

scription of which was published in the *Dental Cosmos* for August last. A close study of that description is necessary for a full comprehension of what I shall present today.

"As a result of wider observation, much thought, and careful experimenting, I think I can today not only greatly simplify the technic in the adjustment and operation of the appliances then presented, but lead you to a more intelligent appreciation of the possibilities and advantages to be gained by the employment of the new method of treatment."

Not satisfied with the "*Pin and Tube*" appliance Dr. Angle in 1916 introduced "*Some New Forms of Orthodontic Mechanism, and the Reasons for Their Introduction.*" [*Dental Cosmos*, September, 1916, p. 969.]

"The introduction of the pin and tube appliances undoubtedly marked a great step forward in orthodontic treatment, for with it was gained not only better control of force for the crown movements of teeth, it was the first practical mechanism for the proper control and distribution of force for the movement of roots of teeth, singly or collectively, and simultaneously with or independently of their crown movements. And, what is of still greater importance, with this mechanism the force for the movements of either crowns or roots can be

applied or controlled in a manner that is far more nearly in accord with the requirements of the physiology of the tissues involved in tooth movement than with any other previously employed. It is well known that more nearly ideal results in occlusion and in bone development, as well as in facial development, have been gained by its use than was ever possible before.

"Its use has become standard with the best orthodontists of this and other countries, and it is of course very gratifying to me to know that my predictions regarding its value have been verified. Yet it is a humiliating fact that many who are attempting the practice of orthodontia seem to be so lacking in judgment and in technical skill as to be unable to gain anything nearly like the measure of success that is possible in the use of this mechanism, or to appreciate the fact that correct forms and proportions and proper material for the construction of the various parts, with accuracy and perfection of workmanship in manufacture, are essential to its proper efficiency. The principal difficulty with most seems to be inability to properly locate the pins and attach them to the metal arch, and many indeed have been the modifications of the mechanism and the substitutes devised in order to overcome this to them insurmountable difficulty, and to obviate the necessity for acquiring technical skill and accuracy. In all instances delicacy and simplicity, and to a large extent efficiency, have been sacrificed. Indeed, some of the productions are so crude and clumsy as to be mechanical curiosities.

"Realizing how apparently hopeless to many is the mastery of the technic of this appliance, I have, after many months of careful thought and experimentation, succeeded in producing another type of mechanism—that which I am about to describe, and which, while retaining much, if not all, of the force control of the pin and tube appliance, possesses other advantages, besides being far easier to apply and operate. In fact it is so simple I think you will agree with me that there is now no necessity whatever for change of principle or modification of form, even by the habitual "modifier," that well-known type of practitioner whose greatest happiness seems to consist of modification of mere details in mechanism—nearly always to the detriment of the mechanism.

"In presenting this new mechanism I fully realize the normal responsibility I must assume, or that anyone must assume when he attempts to add anything to the already very large number and variety of orthodontic appliances. If the added device be not truly useful and an advance beyond what has already been produced, better by far it should never appear, for it will not only cause unnecessary inconvenience and disappointment to many patients and orthodontists, and further add to the confusion of our literature and to the perplexity of the ever-increasing number who review it, but it will lessen confidence in its author. The usual crude modification or mere difference without distinction in principle is more often a step backward than forward, but there are reasons why, at this time, there should be additions to our orthodontic mechanism, additions that are real improvements, the wonderful advances that have been made in the science of orthodontia in the past very few years having made necessary the rearrangement of our entire plan of treatment, and demanding decided betterment in orthodontic mechanism."

## ANGLE'S NEW DEVICES

"The forms of mechanism I shall now describe, if not strictly in accord with all the ideals set forth, will, I believe, upon careful analysis by competent judges, at least be found to be measurably nearer these ideals than any of the forms hitherto employed. They have not been hastily evolved, but are the result of long experience, close and careful observation, and the closest consideration of every detail as to the material of which they are composed, their size, forms, proportions and relations of parts, the mechanical principles on which they are to operate, and the physical and physiological laws that are to govern their use. At the same time the object has been to produce an appliance which will be easy to understand and so simple as to reduce to the minimum the difficulties and exactions of the technic of both its adjustments and operation. This mechanism is of course based on that excellent main principle of the expansion arch given to us long ago by that great Frenchman, *Fauchard*, whom especially all orthodontists are honored in honoring. Some of the devices are but modified forms of my own former, well-known appliance; others are radically new. All are harmoniously proportioned, refined, and very delicate."

## BRACKET

"A, Fig. 38 [Fig. 9], shows a delicate block of metal, or bracket, actual size, and b and c, show it enlarged to facilitate description. All are shown attached to band material. The outer edge of the bracket is rounded, as are also

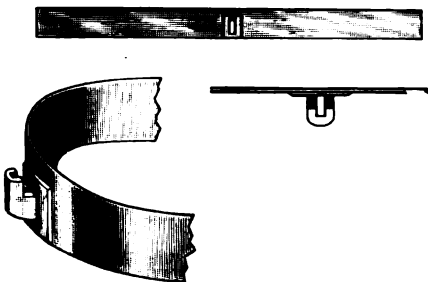


Fig. 9.

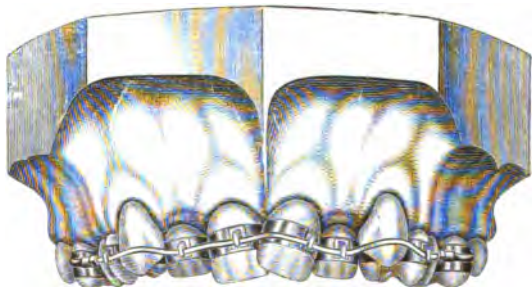


Fig. 10.

its corners and its two ends, its sides being straight and parallel. Inwardly, a deep transverse slot extends downward in the bracket one-half the length of the bracket, terminating in a concave floor. The walls of the slot are parallel, one of them being formed by the band material and the other by the inside of the bracket proper. In the center of the latter wall is a delicate square perpendicular groove which passes downward and through the floor of the bracket. Its use will be considered later. The band material to which the bracket is soldered and which forms the inner wall of the slot is thickened at this point which is very important, in order to give it the necessary strength. Fig. 39 shows several bracketed bands fitted and cemented to the crowns of the incisors of an upper dental arch typical of those, especially in Class 1, in which the teeth are crowded and the dental arches proportionately diminished in size. It will be especially noted that the seams of the bands have been formed on the lingual surfaces of the teeth, and that the brackets are located at the *center* of their labial surfaces."

"*Ribbon Expansion Arch*, is a very delicate, flat, continuous, or nonsectional, expansion arch with parallel sides and rounded edges. It has, therefore, the form of a ribbon, and in order to distinguish it from the other forms of my expansion arches, I have called it the 'ribbon' expansion arch. It is but twenty-two thousandths of an inch (.022") in thickness and thirty-six thousandths of an inch (.036") in width. Its ends are also flat, but threaded, and are provided with my well-known friction lock nuts, which have been greatly reduced in diameter in order that they may conform to the delicate proportions of this arch, which is used in connection with the usual anchor clamp bands, the sheaths of which are also reduced in diameter and possess other novel features which will be described later. They are shown on the teeth in Fig. 39" [Fig. 10].

It will not be necessary to describe the application of this appliance, the following illustrations explain themselves.

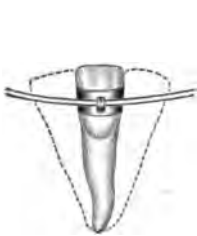
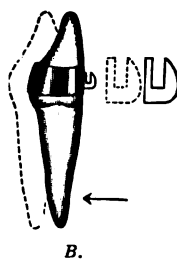


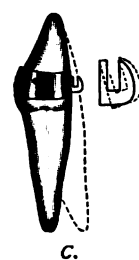
Fig. 11.



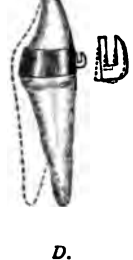
A.



B.



C.



D.

Fig. 12.



Fig. 13.



Fig. 14.

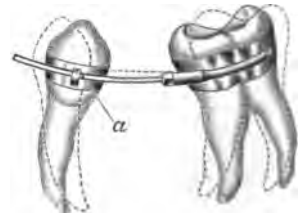


Fig. 15.

#### SUMMARY OF ADVANTAGES OF THE NEW DEVICES

"From the foregoing it will be apparent that the force may be so controlled as to permit or to prevent the tipping of any tooth or teeth to any extent, or to compel the bodily movement of any tooth or teeth in either or both arches.

"It will have been noted that this mechanism is of the greatest simplicity, of the maximum delicacy of parts, and with all unnecessary material eliminated. Hence it is of the least inconvenience to patients and the easiest to keep cleansed. It would seem that the mechanism is nearly ideal, not only for securing the necessary static force for anchorage and of dynamic force for tooth movement, but for directing and controlling this force so that all cellular change attendant on tooth movement most nearly accords with the laws of physiology. It is also graceful in its proportions and not displeasing in appearance. In a word, the principles of mechanics, art, and physiology do not conflict, but are made to

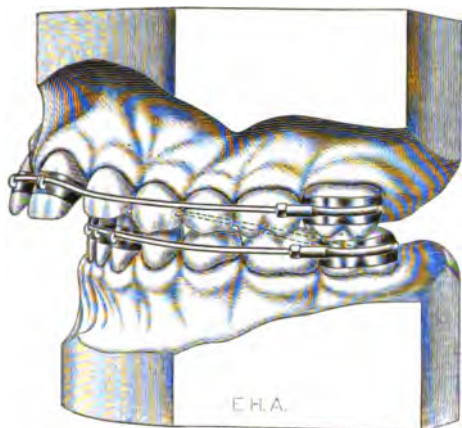


Fig. 16.

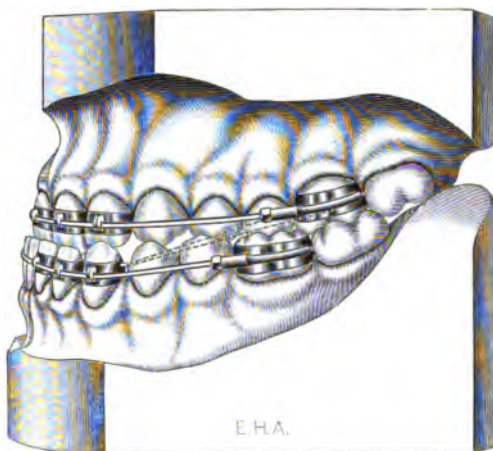


Fig. 17.



Fig. 18.

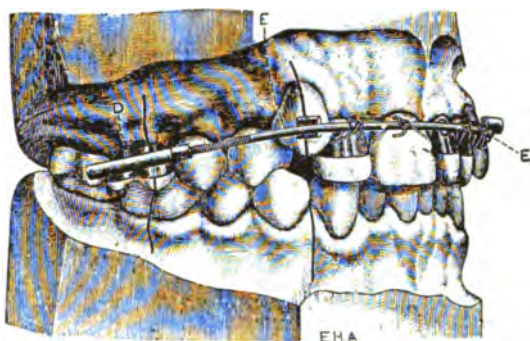


Fig. 19.



Fig. 20.

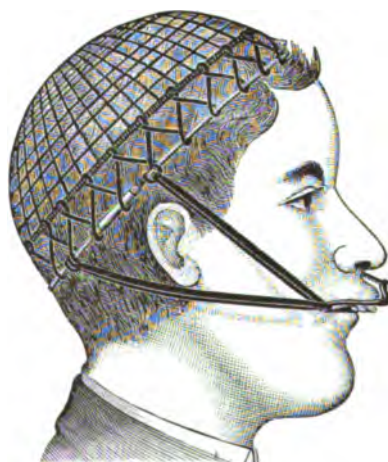


Fig. 21.



harmonize beautifully and as was never possible in orthodontic mechanism before. It is so simple and easy to apply as greatly to lessen the usual work of the orthodontist and the usual number of visits of patients. It is not expected that it will wholly supersede the pin and tube mechanism, neither will it wholly supplant the expansion arch in its round form with ligature attachments. In fact, the ligature attachment will be found to be of advantage in connection with the ribbon arch in the movement of premolars and of other teeth that may be so pronouncedly misplaced as to render impracticable the bending of the ribbon arch to gain bracket attachment with them until after they have first been moved into more favorable positions by means of ligatures. But in the great majority of cases the mechanism herein shown will be found to possess such obvious advantages in force control and in ease of application and operation, that I believe it will find a permanent place in orthodontia.

"In concluding the description of this mechanism, let me say that I have given such close care and thought to perfecting it in all its details, and have been so ably supported by the manufacturers, that I feel sure that it can not be improved by modifications or additions, at least not until you give it years of thought and study, as I have. Therefore let me earnestly advise that, instead of attempting to modify it, you devote your energies to understanding it and its possibilities, and to perfecting your skill in the technic of its application and operation. In this way your opportunities for self-improvement will be greatest, and you will be able to confer the greatest amount of good on your patients. Apt in this connection is the remark of the great surgeon, *Hamilton*:

"It is not in the discovery and multiplication of mechanical expedients that the surgeon of this day declares his superiority, so much as in skilful and judicious employment of those which are already invented.'"

Fig. 19 shows an old type of appliance used by Dr. Angle applied to a model. Fig. 20 shows Angle's "chin cap" and "head gear," and Fig. 21 is another illustration of Angle's "head gear."

# **ABSTRACT OF CURRENT LITERATURE**

**Covering Such Subjects as**

**ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY**

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

**Epithelioma of the Buccal Mucosa. L. Imbert. Marseille-Medical, 1919  
No. 3, p. 123.**

Cancer of the buccal mucosa is perhaps somewhat less frequent than cancer of the tongue, but is not very exceptional. It is of extreme malignancy, with extensive and premature glandular involvement. The primary focus remains undiscovered for a long time, it is usually situated behind the commissure, but soon spreads in the various directions offered to it, as follows: (1) Along the entire extent of the oral mucosa, especially downwards; (2) on the gums, whence it reaches one of the jaws, preferably the lower; (3) towards the skin, the tumor ulcerating neoplastic proliferation; (4) towards the glands, usually the sub-maxillary glands.

In the author's opinion, infiltration of the maxillary bones is relatively rare, but this may be due to his having operated on not very advanced cases; a few of these, however, had been considered as inoperable by other surgeons. The gums were not involved in these cases, so that the underlying bone could be safely regarded as intact. When doubts exist in this respect, the operator should not hesitate to perform a thorough curettage above and below. With special reference to the teeth, carious teeth are almost invariably present. While the patient could, of course, be referred to a dentist before any operative intervention, it seems preferable on the whole to do the dental extractions in the course of the operation, any surgeon being able to do this work when the buccal cavity has been so widely opened by a commissural incision. All carious teeth and stumps must naturally be removed, but the author regards it as advisable to remove all the upper or lower molars as a routine procedure. This precautionary measure guards against the frequent and practically constant recurrences, which can only be hastened by contact with the teeth, in a mouth where measures of cleanliness are necessarily difficult after the operation.

The author never had occasion to perform resections of either maxilla, and there was no reason to regret this, as recurrences were invariably noted by him in the soft parts or the glands. Extirpation of the submaxillary glands, when these are enlarged, is an indispensable supplement of the operation. Immediate



results of surgical intervention in these cases are good, and the patients recover promptly, but are exposed to a double danger in the form of constriction of the jaws and recurrence of the neoplasm. The latter may be considered as the rule, the tumor reappearing either in the preserved soft parts, or in the glands, or very frequently in both these locations together. Constriction of the jaws is likewise practically constant; even when a very large flap has been applied, the absence of mucosa on its deep aspect gives rise to adhesions which are very difficult to handle. For this purpose, the author employs the dilators in use against the constriction following war wounds, especially the wooden wedge which the patients insert themselves, morning and evening, between the jaws, and with the assistance of which they succeed in preserving a certain degree of opening the mouth.

**Epithelioma of the Tongue.** P. Delbet. *Progres medical*, 1919, No. 11, p. 105.

The patient, an elderly woman, came under observation in the Necker Hospital in Paris, complaining of a persistent ulceration of the tongue and exaggerated salivation. On examination, an irregularly outlined gangrenous ulceration was seen on the right border of the tongue; on attempting to palpate the ulcer margins, a very pronounced induration was encountered, this infiltration constituting the tumor itself. A series of neoplastic glands could be felt in the sub-maxillary and carotid regions, which must always be explored in similar cases. This case represents one of the most acutely dangerous, inoperable types of lingual epithelioma. Some of these tumors assume a protuberant form, the so-called cauliflower growth, which is not the most malignant type, the ulcerative form as seen in this patient being much more likely to penetrate deeply into the organism. The gravity of these epitheliomas is explained by the fact of their belonging to the variety of lobulated pavement epitheliomas which are not amenable to radiation-treatment as utilized in the treatment of neoplasms. The danger to life following operations in these cases was formerly attributed to movements of the stump which was fastened by a thread to the patient's ear, but the real cause of sudden death seems to be through reflex irritation of the superior laryngeal nerve. These patients often seek advice too late, for what is considered by them as a simple ulceration of the tongue. Six months previously, this patient could have been cured by means of a harmless operation.

**Bilateral Syphilitic Parotiditis with Left-Sided Facial Paralysis.** A. Lermierre. *Bull. et mem. Soc. med. d. hop. de Paris*, 1919, No. 18, p. 510.

Syphilis of the salivary glands is a rare disease which the author was recently enabled to observe in a soldier 22 years of age, admitted to the hospital under the diagnosis of parotid tumor. He promptly recovered under the influence of specific treatment. The trouble began two months ago, without fever or disturbance of the general condition; the left parotid gland began to swell, followed three days later by a swelling of the right parotid. The two glands continued to increase in size for a month, the enlargement being progressive, without exacerbations, or pain of any kind. At the end of this month, left-sided facial

paralysis made its appearance. The entire condition from now on remained stationary, the parotids neither increasing nor diminishing in size. A malignant tumor was suspected and the patient at this time was referred to the author, who on examination found a very pronounced swelling of both parotid glands. The face was enlarged and deformed. The left parotid was slightly larger than the right; on palpation, both glands were uniformly hard, like wood, and regular without nodules; their contours were very distinctly outlined. Pressure gave rise to no painful sensation. The tissues and coverings were normal, without edema or redness. On the left side, facial paralysis of the peripheral type was present. The eye could not be closed, and there was some epiphora. Frowning and wrinkling the forehead was weak and imperfect. The mouth was deviated toward the right side, and the patient was unable to whistle. There were no glandular swellings, no dysphagia, no trismus, no dryness of the mouth. The orifices of Steno's ducts were normal. No swelling of the submaxillary and sublingual glands was demonstrable. In view of the bilateral character of the lesion and the appearance of the parotids, the diagnosis of tumor was abandoned, in spite of the facial paralysis, in favor of parotiditis. The origin of this inflammation, however, could not be discovered by questioning or examining the patient. Exploration of the viscera, the nervous system, the skin coverings and mucous membranes, remained entirely negative. The general condition was excellent, and the patient had not lost in weight. The institution of potassium iodide treatment, in progressive doses (up to 4 grams daily) led to a remarkably prompt recovery. In less than eight weeks, no trace of the parotid swelling or facial paralysis was left; and the iodide treatment, which had been very readily tolerated, was stopped. The patient left the hospital well and has since remained in excellent condition, without recurrence of the local disturbances.

**The Osteo-Periosteal Graft in the Treatment of Pseudarthrosis of the Mandible Following Gunshot Injury. [C. F. Rumsey, *British Dental Journal*, 1919, xl, No. 19, p. 727.**

It is in the cases of mandibular fracture presenting definite pseudarthrosis with loss of bone that the bone graft holds out the prospect of a cure with the best functional results. The high claims advanced on behalf of the osteoperiosteal method by the French school are confirmed by the results of bone-graft operations in nine cases in the author's personal experience. The technic adopted by him involved some small modifications from that practiced by the French, with the following particular advantages: (1) The graft fills the whole gap and not only the lower half, as so frequently happens with the other types; (2) it restores the full continuity of the mandible; (3) no foreign bodies are required for anchorage; (4) curvature of the bone is no deterrent, as the grafts are easily bent into the required shape and then wedged; (5) the operation is performed more quickly.

Description of modified technic. A crescent-shaped incision was first made with the horns upwards, the center of the incision corresponding to the area to be grafted. A skin flap was then reflected upwards and secured. The incision

was next carried down to the lower border of the bone and a large fat flap carefully dissected up from the external faces of the bony fragments. This was also secured from above. The bony fragments were then isolated, cleaned, and freshened with a chisel and the fibrous tissue removed from the interfragmentary area (the most tedious part of the operation). The next stage consisted in separating the periosteum from the inner aspect and upper border of the fragments. This latter procedure was fairly safe on account of the attenuation of the bony extremities. Two laminae of periosteum with subjacent compact bone, of sufficient width and length to cover the gap and allowing considerable overlap, were then chiselled from the anterointernal aspect of the tibial shaft. These laminae were of sufficient thinness to curl up somewhat after the manner of wood shavings. One was laid internal and the other external to the bony fragments, the ends being wedged under the tissues overlying the fragments. The intervening space between the grafts, corresponding to the gap, was filled in with small pieces of compact bone chiselled from the shaft of the tibia. The fat flap was then released and sutured in position over the grafts, forming a thick pad, which held the external graft in position, and finally the skin flap was brought down and sutured in position over all.

#### **Free Transplantation of the Rib in the Treatment of Mandibular Defects.**

E. Redwitz. *Korr. Blatt f. Schweizer Aerzte*, 1919, No. 39, p. 1493.

The author discusses the question of grafting in mandibular defects, his personal observation being strongly in favor of free costal transplantation. Radiograms which were taken seven years after the operation in an illustrative case showed that the rib had healed in perfectly, as had also the wire which served for the suture. The structure of the rib was plainly demonstrable. The good cosmetic and functional result proved permanent and underwent no changes. For the substitution of the ascending ramus of the lower jaw, the metatarsus would seem to be the most suitable, in view of its configuration.

#### **Rotation of the Cheek in the Plastic Surgery of the Face.** L. Esser. *Korr. Blatt f. Schweizer Aerzte*, 1919, No. 39, p. 1496.

The method of facial plastics, inaugurated by the author, consists essentially in utilizing the cheek and the adjacent submaxillary and cervical regions for the plastic material required in the filling of defects and replacing of changed or cicatricial portions of the skin. This procedure guards against the disadvantage of the plastic skin-substitute being recognized even from a distance as some foreign material, as is true in grafts from the skin of the forehead or arm. In plastic work on the nose, the disfiguring frontal cicatrices are done away with. According to the situation of the defect, a curved circumferential incision is applied on the cheek at a suitable level, the incision passing at first rather horizontally, if possible in a line with the lower furrow of the eyelid as far as the ear, and from here along the posterior maxillary border to slightly below the maxillary angle. Smaller defects require proportionately smaller flaps from the cheek. The resulting skin flap, which always contains the external maxillary artery, is

now undermined to a variable extent, under preservation of the facial nerve and the mimic muscles, and is then rotated upwards and forwards. This procedure, which has long been applied in plastic surgery, is described by the author as rotation of the cheek. The method is well adapted for the plastic repair of the eyelids, cheek, nose, lower and upper lip, tissues of the same character being exclusively utilized. Very favorable results were obtained by its employment in a great variety of cases.

**A Curious Ocular Syndrome of Dental Origin.** H. H. Martin. *Southern Medical Journal*, 1919, No. 3, p. 157.

The unusual features in this case, which concerned a man of 49 years who came under observation complaining of imperfect vision and a floating opacity in the right eye were the contracted field, the sharp limitation of exudates to the anterior third of the vitreous, and the startling promptness with which all symptoms began clearing up on the removal of the supposed cause, which was clearly a dental lesion. The only focus of infection that could be demonstrated was at the apex of the right upper incisor teeth, which was inanimate as the result of removal of the pulp some years previously. This tooth was extracted and was found to contain pus, the pulp cavity being filled with a thin foul-smelling fluid with a small apical abscess. Three days later, vision in the right eye was very much improved and this improvement continued without interruption for about seven weeks, the left eye remaining entirely unaffected during this time. About two months later, precisely the same condition recurred in the same eye, and an examination revealed marked tenderness over the site of the former dental lesion, with two minute fistulous openings through the roof of the mouth just posterior to the former site of the right upper incisor. The dental lesion was exposed and thoroughly curetted; a small alveolar sequestrum was found and removed. The very next day vision had improved to 20/30, and three days after the operation the field had been extensively restored. The lesson taught by this case is that no focal infection is too insignificant to cause serious lesions in a highly sensitive vascular structure such as the eye.

**Idiopathic Epilepsy Due to Empyema of Antrum of Highmore.** J. C. Keeler. *The Laryngoscope*, 1919, xxix, No. 8, p. 484.

The etiologic factor in a case of epilepsy concerning a soldier 34 years of age was discovered to be a focal infection in the antrum of Highmore. During the past five years, the patient suffered frequent convulsions, the attacks increasing in frequency and severity. Hearing in the left ear was diminished to about one-third the normal power. His gait was staggering; he had attacks of dizziness so great that he would fall if not supported. Immediately preceding a convulsion, he experienced queer feelings in his head (aura), and he observed that after a convulsion there was a thick, light-colored, offensive discharge from the nose, which seemed to relieve the head symptoms. Examination of the nose revealed a few drops of pus over the left inferior turbinate, and transillumination showed a dark shadow of the left superior maxillary sinus. The

diagnosis of empyema of the antrum was confirmed by radiography. Irrigation of the cavity, with evacuation of offensive pus was followed by considerable improvement of the hearing and general health. Irrigation was discontinued three or four days, when he again became dizzy, his hearing again became impaired, and he was apprehensive of another convulsion. Radical interference was found necessary, and the so-called Caldwell-Luc operation was performed under ether anesthesia, recovery after which was rapid and complete.

**The Relation of Diet to the Development of Children, with Special Reference to the Teeth.** F. B. Talbot, *Medical Clinics of North America*, 1919, ii, No. 5, p. 1333.

The author points out that in studying the diet and its relation to the teeth, the role of calcium phosphate in metabolism must be understood. It must be considered from the point of view of the metabolism as a whole and of the metabolism in diseases of the bony structure, such as rickets, the commonest disease of the bones, and an affection of infancy. Rickets is the disease most often associated with delayed dentition; it is characterized by a deficiency of calcium in the skeleton. There seems to be enough evidence to conclude that certain abnormalities of digestion may so affect the absorption of calcium that rickets develops even when the food contains a sufficiency of calcium. According to a table prepared by Sherman, showing the calcium contents of the common articles of food, beef, polished rice, and bananas are extraordinarily low in calcium. The more highly refined wheat is, the less calcium does it contain. Milk, oatmeal, and beans stand out as containing large amounts of calcium, and obviously should be given in large amounts when it is desirable to feed more calcium to the body. Phosphorus is necessary as well as calcium to form skeleton and teeth; it is deposited in both structures in combination with calcium. An abundance of phosphorus in suitable forms is most readily and economically secured by the free use of milk, eggs, vegetables, and such cereal products and breadstuffs as contain at least a part of the outer layers as well as the inner portion of the grains. Plain cheese, containing all the calcium of milk, should be used much more often than is the custom in this country.

There are no drugs known that will affect the growth of teeth. Rickets is said to be affected favorably by teaspoonful doses of phosphorus and codliver oil in the proportion of 1:3000. The formation of tartar deposits on the teeth can not be explained through any principles of biologic chemistry known to the author, who emphasizes that its formation must be prevented on the basis of well-known general principles of dietetics and hygiene, both of the teeth and the body.

**The Practical Use of the Dental Radiograph.** Sterling V. Mead. *The Dental Cosmos*, 1919, xli, No. 10, p. 965.

Radiography, now one of the most important branches of dentistry, is doing more to elevate the dental profession than anything else, and the author emphasizes the great responsibility which is being placed upon dentistry by reason of the disclosures of the radiograph, a responsibility which the profession is

fast proving capable of assuming. The radiograph is a valuable diagnostic aid in dentistry when interpreted by one thoroughly schooled in dentistry and one who understands what it really shows and who knows its defects and limitations. The variegated uses of the radiograph are concisely shown in the following list:

1. To determine whether the mouth is the focus of infection, producing systemic disturbances.
2. To determine whether the teeth are the cause of reflex irritation, such as neuralgia, headaches, etc.
3. To determine whether there is apical or periodontal infection.
4. To follow the course of a fistulous tract.
5. Proving root-canal fillings and locating canals.
6. To determine whether or not there is a perforation.
7. To determine condition of teeth before filling and when contemplating a restoration.
8. To determine the extent of radiolucent area.
9. As an aid in extraction of impacted teeth or unerupted teeth.
10. As an aid in locating roots, fusion of roots, etc.
11. To determine whether permanent or deciduous teeth.
12. To determine the presence of permanent teeth.
13. To determine when to extract deciduous teeth.
14. To determine whether teeth are fully formed.
15. In the practice of orthodontia.
16. To show supernumerary teeth.
17. To show pulp stones or secondary deposits encroaching upon the pulp.
18. To show excementosis.
19. Before and after apicoectomy, resection, etc.
20. To show fracture of bone.
21. To show fracture of teeth.
22. To show overhanging fillings.
23. To show ill-fitting crowns.
24. To locate hidden dental caries.
25. To show extent of periodontal bone destruction in pyorrhea alveolaris.
26. In diagnosis of pathologic conditions of the maxillary sinus.
27. To locate foreign bodies.
28. To observe planted teeth.

**A Protest Against the Reckless Extraction of Teeth.** W. Alvarez, *Journal American Medical Association*, 1919, lxxiii, No. 16, p. 1179.

The author enters a protest against the exaggerated and indiscriminate removal of teeth, recommended by the radical group of dentists, and urges more conservative measures in view of the fact that the most thorough removal of focal infections often fails to cure arthritis and other diseases. Serviceable teeth should be saved whenever possible. There need be no question as to the removal of infected teeth which are loosened, perhaps hanging to wobbly bridges, or which have lost their crowns. Conditions are altogether different if the teeth

are strong and serviceable, if the areas of rarefaction are small and questionable, and particularly if restoration by bridges will be impossible. Such patients should be candidly told that the proposed extraction is more or less of an experiment. In some cases the bacteria which may originally have entered through the jaws seem to have obtained so firm a hold on the joints, the heart valves, and other tissues that they will not leave simply because their old port of entry has been closed. In other cases, irreparable damage has been done, and the joints can not return to normal even after the disappearance of the infection. It must be kept in mind, moreover, that focal infection is probably not the only case of arthritis; which in a number of cases is plainly tuberculous or gouty. The unsatisfactory outcome of reckless extraction of teeth could often have been foretold by an experienced physician, who would have warned the dentist to proceed cautiously and conservatively. Radiograms which were used in deciding which teeth were to come out have sometimes been secured by the author, and he was unable to find more than one or two roots which after years of experience he would call infected. In some, downward projections of the antrum had evidently been mistaken for abscesses. In others, it seemed to him that the physician, quite oblivious to any possible value of the teeth to their owner, must have ordered their extraction simply because he believed it a panacea for most diseases.

**The Relation of Oral Sepsis to Mental Diseases. H. A. Gotton. *Journal of Dental Research*, 1919, i, No. 3, p. 269.**

The author feels that he does not overstate the facts when he says that insanity can be prevented or cured by a conscientious practice of the principles discussed in this paper, and that, in the same way, many other diseases which in most cases have a fatal termination, can also be prevented or cured if the process has not gone too far. The fact has been recognized for years that infections and toxemia cause mental disease, and a small group of such cases has thus been diagnosed as "toxic infectious psychoses." Infection is conceded as playing an important part in the etiology of mental conditions, but its presence is often difficult to establish, because chronic infections often produce neither subjective nor objective symptoms, and are, therefore, difficult to demonstrate by the ordinary methods of examination. The possibility of curing mental diseases by eliminating infected teeth was first shown by Upson, in 1908, who reported cases of the so-called functional psychosis as both dementia precox and manic-depressive insanity, which recovered when impacted and unerupted molars were extracted, and root infections were eliminated. An active interest in the teeth of their patients, by physicians, will do much to prevent occurrence of nervous and mental diseases. Very serious trouble may originate in the teeth without being discovered, and may be allowed to progress to the point where it finally causes the death of the patient, or if not that, a condition worse than death, a life of mental darkness.

In the New Jersey State Hospital, Trenton, where very favorable reports have been obtained by means of radical extraction of all suspicious teeth, the x-ray is utilized to determine the existence of alveolar abscesses. Simple inspection by

a competent dentist often suffices to determine the existence of teeth which need to be extracted. All capped and pivot teeth are extracted, and all fixed bridge-work is removed, as a precautionary measure, in the best interest of the patient. The radiogram can not always be depended upon to show infection, for it fails to reveal a type of soft granuloma, especially just below the gum where the bone tissue is not involved. Imperfectly filled teeth may also be infected and have to be removed, even if the radiogram is not decisive.

In about 25 per cent of the Trenton mental cases, the teeth alone seem to be the source of infection, and with the removal of this source, the patients rapidly recover. (In speaking of mental cases, the so-called functional group is meant, for which no definite etiology had previously been found.) In another group, about 25 per cent, both the teeth and tonsils are at fault; in a third group, about 50 per cent, the gastrointestinal tract is also involved, with either the teeth or the tonsils, or both. Infected teeth, or the bacteria concerned in this infection, have a direct and very important relation to the pernicious activity of the colon bacillus. The organism principally concerned in dental infection is a nonhemolytic streptococcus known as *Streptococcus viridans*. These types, which produce a chronic infection, are nonpus-producing, and therefore their presence is masked, but they are extremely toxic, and all of the important symptoms are due principally to this characteristic, especially where the nervous system is involved. The complement-fixation test of the blood for *Streptococcus viridans* is very valuable in doubtful cases, and could be used to advantage by the dentist to determine the necessity for extracting suspicious teeth in the absence of apparent constitutional symptoms. If the test proves positive, then all possible sources of infection should be eliminated. This method, like the Wassermann reaction, is not infallible, and will be negative in some cases in which the infection is present. The author emphasizes the importance of the complement-fixation test of the blood for the streptococcus group as a means of determining whether or not suspected teeth are causing systemic disturbance. Every suspicious tooth should be extracted before the infection has reached dangerous proportions.

**Roentgen Ray Indications for Tooth Extraction.** Byron C. Darling. *Journal of Dental Research*, 1919, i, No. 3, p. 391.

*Summary of Conclusions:* (1) The roentgenogram, when interpreted by the trained medical or dental roentgenologist, is one of the most dependable means of diagnosis of conditions that may indicate tooth extraction. It shows when the condition of an infected tooth is such that it means the health of the patient. (2) Tooth extraction should be more generally prescribed: at present no other method for the cure of dental abscesses can be guaranteed to remove the focus of infection that leads, or may lead, to systemic diseases. (3) The trained medical or dental roentgenologist, and not the dentist, should be the best and final interpreter of the roentgen plate in the diagnosis of tooth conditions, since the roentgenologist can have (a) neither pride of reputation in the previous dental work, (b) nor any financial interest in the future dental work, and (c) his training has been taken for the purpose of interpretation and valuation of x-ray



evidence. (4) The commercial x-ray laboratory offers unprofessional and unreliable work and service, and, therefore, should be discouraged. (5) The dentist should not attempt to do x-ray work himself, since the practice of dentistry itself is so comprehensive that it requires the whole time and energy of the dentist, allowing little or no opportunity for expert study of the technic and interpretation of roentgenology that pertain to his diagnostic survey work. (6) The admission of the professional x-ray expert, either medical or dental, as a consultant, divides the responsibility for a case among three experts, physician, dentist, and roentgenologist, with consequent obvious advantages to the patient. (7) The writer offers his graphic chart as a means of convenient and definite explanation of diseased conditions of teeth for the benefit of the physician, the dentist, and the patient.

**A Contribution to the Study of Fusio-spirillary Marginal Gingivitis. D Clewer. *British Dental Journal*, 1919, xl, No. 20, p. 749.**

In the early spring of this year, while the author in his capacity as dental officer was stationed at Charleroi, in Belgium, fully 50 per cent of cases attending him for dental treatment came on account of gingival trouble of fusio-spirillary origin. So many officers and men have been under his care lately that he has been led to endeavor to trace some abnormal condition that might be regarded as a contributory factor, and which would tend to make the soldier susceptible to this disease. This factor he believes to be a dietetic one, due to the very marked lack of antiscorbutic vitamins in the normal diet of the soldier on active service. Upon the basis of his investigations, he concludes that there is good reason for presuming that fusio-spirillary marginal gingivitis has its origin in the invasion by specific microorganisms of tissues, the vitality of which has been depraved by the comparative lack of antiscorbutic vitamins in the diet of the soldier on active service. The condition has been observed in military camps in England, but certainly not with a frequency approaching that observed in the war zone, and this is probably explained by the fact that, although the amount of vitamin was restricted there, the soldier usually had facilities for the individual purchase of fruits and salads. Further investigation may shed some much needed light on the subject, and if the condition is found to take a place among the deficiency diseases, the war diet of the soldier might be suitably modified with the object of preventing what is and must be a serious item in the sick-wastage of an army in the field.

**Reflex Disturbances Originating in the Nose, Throat and Mouth. I. L. Clark. *Texas State Journal of Medicine*, 1919, xv, No. 6, p. 219.**

Reflex disturbance from the teeth is caused by: (1) Irritation and infection of the gums. (2) Decayed teeth. (3) Impaction. (4) Mouth-breathing. (5) Faulty dental work. (6) Lack of attention of cleanliness. (7) Delayed dentition. Teeth should be inspected and cleaned every six to twelve months and fillings put in early when necessary. One of the most serious things that happen from neglect is abscess formation at the roots of the teeth, and if the focus is

not properly drained and cured in the early stage, it becomes a most difficult condition to eradicate. The author does not believe it is possible to cure an abscess at the root of a tooth if of long standing, where the sac is lined with pyogenic membrane, unless the tooth be extracted. It is possible for the patient to absorb toxic material from these blind abscesses without any local reaction, such as soreness or pain, to indicate trouble at the root of the tooth. It is very important to make use of the x-ray in these cases, in order to locate these obscure foci. Impaction and dentition are other conditions where the x-ray is of utmost value.

The following conditions can be traced to focal infection from the gums and teeth: (1) Rheumatism in all its forms. (2) Neuritis. (3) Neuralgia. (4) Insomnia. Gastrointestinal disturbance. (5) Eye disturbance. (6) Furunculosis. Decayed teeth that have not been properly prepared before fillings are put in will cause trouble sooner or later, and this applies to crowns, also. The position of wisdom teeth is often faulty, and decay is common. Failure of wisdom teeth to come through is usually due to impaction against the last molar, and this results in an involvement of the reflex nervous system. Free nasal breathing is important for the proper development of the arch.

**Morbidity of the Teeth Secondary to Nutritional Disorder.** [Semana Medica, May 29, 1919, xxvi, No. 22.]

Castilla has been making a special study of the relations between anomalies and caries in the teeth and gastrointestinal derangement. He found that children with a history of nutritional disorders frequently had abnormal teeth, the enamel was less perfect and tartar and caries were frequent. Children who seemed to have kept in good health had much more perfect teeth than those with a gastrointestinal past, especially colitis. He noted also that the intensity of the morbid changes in the teeth were always proportional to the duration and intensity of the nutritional process. These changes in the teeth were found in children of 1½ to 4 years old. In older children, apparently healthy but with these changes in the teeth, investigation of the antecedents nearly always disclosed the same causes as in the others. Removal of the tartar only transiently arrests the process.

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## EDITORIALS

### The Relation Between Rhinology and Orthodontics

**D**URING the past few years several articles and editorials have appeared in the JOURNAL dealing with the close relation which exists between rhinology and orthodontia. In this issue we are publishing a paper by Dr. E. W. Alexander, read before the Pacific Coast Society of Orthodontists, entitled "The Correlation of Rhinology and Orthodontia." We are pleased to publish such articles and believe that a great good can be done by bringing the specialties of rhinology and orthodontia closer together. We are aware that orthodontists and rhinologists sometimes hold different views regarding certain subjects, and in the paper read by Dr. Alexander, who is a rhinologist, we find statements made, which, from an orthodontic standpoint, should not pass unchallenged. If Dr. Alexander is right, he should substantiate and bring forth more facts to prove his state-

ments, because they vary from what has been found by certain men in the practice of orthodontia.

There has been much discussion about the etiology of the deflected septums and high and narrow dental arches, and whether a deflected septum can be benefited by widening the dental arch. From orthodontic observation of a large number of cases which are on record, it is proved that the widening of the dental arch associated with the deflected septum from above downward causes the septum to become entirely straight, or at least greatly improved as the result of the developmental changes of the entire maxillary bone. It is with considerable surprise that we read the statement in Dr. Alexander's paper: namely, "One can not, for instance, expect to correct a traumatic or developmental deviation of the septum, except in selected cases, by any procedure short of surgery. I imagine that if a septum is deflected by the upward growth of the maxilla, as it forms the Gothic arch, then it will after its complete ossification in its pathologic shape, associated with spur formation, etc., act as a mechanical hindrance to your efforts to widen the arch, because it will hold up the peak."

In the first place, from an orthodontic and developmental standpoint, we have no evidence that the deflected septum is produced by an upward growth of the maxilla. Regardless of how great an underdevelopment of the maxilla may be present, we find no evidence to substantiate or even suggest that the maxillary bone has ever grown upward and deflected the septum. Careful measurements made of faces, if they are made from a fixed point namely, the nasal process of the frontal bone, and external auditory canal, will show that in the development of the face, the roof of the mouth with the superior maxillary bone gradually grows downward. There is never any stage in life in which it grows upward toward the ethmoid bone. There are conditions in which the maxilla does not grow down as rapidly as it should, with the result that the nasal septum, which is mostly of cartilaginous origin, grows down to its normal length, and, meeting with resistance because of the failure of the downward growth of the superior maxillary bone, becomes deflected. The etiology of deflected septums from above downward associated with narrow dental arches is that the maxillary bone has not grown down fast enough to keep pace with the developing septum and the nasal septum has become deflected for that reason. We should like to have the doctor substantiate and bring forth evidence to prove in his cases, if he has found any, that the superior maxillary bone has grown upward, for our observation and investigation in various cases has never shown anything to suggest that condition. Neither has orthodontia found any case that was associated with the deflected septum in which the deflected septum interfered with the widening of the dental arch.

We have, however, found a great many cases in which the widening of the dental arch has produced a marked lowering of the roof of the mouth, which has allowed the deflected septum to straighten and present a much better condition. We are in no way opposed to a submucous operation on the nasal septum where the operation is indicated, but we do not agree with the theory that a submucous operation of the septum is going to assist in the widening of the superior dental arch. From an anatomic study of the articulation of the nasal

septum with the maxillary and palatal sutures, we fail to find any union which would indicate that the nasal septum would exert sufficient pressure or force to prevent the widening of the dental arch. In fact clinical observation has proved that the nasal septum where it is deflected from above downward becomes better as the dental arch is widened; and if it does not improve, the widening of the dental arch is in no way interfered with, neither is there anything that would indicate that the widening of the dental arch would have been hastened by a submucous operation before the orthodontic treatment of the case.

We realize that we can not expect the same developmental changes to occur in adults that we find in children. However, we are inclined to believe that more facts should be presented before orthodontists accept the teachings that the roof of the mouth grows upward during the period of the development of the deflected septum and that a submucous operation on the septum should be performed in all cases before the dental arch is widened. From an embryologic and anatomic standpoint, and clinical observation, we believe the orthodontic view of the case; namely, that the maxillary bone grows downward, under normal condition, followed by the same downward growth or lengthening of the septum, is correct. Secondly, if as a result of the underdevelopment, the superior maxillary bone fails to grow downward as rapidly as it should, those conditions will by no means affect the growth of the septum, but, meeting with resistance from below it will be deflected. Third, we find as result of clinical experience that when the dental arch is widened, it produces a development of the superior maxillary bone, and the roof of the mouth assumes a lower position and the deflected septum is benefited. It is because these things have been so apparent to a large number of men in the practice of orthodontics, we can not allow Dr. Alexander's statement in regard to the etiology of the deflected nasal septum and the treatment of narrow dental arch to pass as being accepted from an orthodontic standpoint.

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### The Section of Orthodontia and Periodontia

WHEN the National Dental Association was organized along the lines of the American Medical Association and different sections were formed for the purpose of having papers that were related grouped together, we find as a matter of record that one section was organized that included orthodontia and periodontia. It had been stated in times past that there was more or less correlation existing between the subjects of orthodontia and periodontia, and probably for that reason the two specialties were grouped together. We have editorially called attention to the interests which exist between the two subjects, but whether at the present time that relation is close enough to warrant the existence of the combined specialties in one section is a matter that will have to be proved. In fact, a number of orthodontists have asked why the two specialties were ever grouped, and what is the purpose of the section on Orthodontia and Periodontia. Not being periodontists, we do not know exactly what the plan of that specialty is in regard to the papers which they present before the section, and as orthodontists, we probably know less in regard to the matter. Some have stated that

the purpose of the section was to have papers from the two specialties which would be of interest to both groups. In fact, I think that was the object of the arrangement of the papers that were read at the first meeting of the section at Chicago. Whether or not the first meeting was a success, by the papers being of interest to both specialties, we do not know, but if that was the object at the New Orleans meeting, it was a decided failure. The papers read on orthodontia could hardly be considered as being of any interest to periodontists, which was thoroughly demonstrated by the fact that 95 per cent of the periodontists left the audience the last day at the time the papers on orthodontia were being read. However, they were perfectly justified in doing so, for on the first day of the meeting after the two orthodontic papers were read, the entire body of orthodontists, with the possible exception of two or three, left the room while the periodontic papers were being given. In other words, neither one of the societies showed enough courtesy to the other to stay in the room while the papers on the other subject were being read.

From a general review of the conduct of the members of the section, one would be forced to admit that so far as the individual practitioners of the specialties are concerned, they do not mix and do not care to listen to papers read by the other side. If that is the case, then it necessarily follows that the section, so far as giving papers which are of interest to both specialties is concerned, was an absolute failure as conducted at the New Orleans meeting. Whether this is because the papers were not of interest to the two specialties or whether it was because of the manner in which the program was arranged is difficult to say. It may have been because the two specialties will not mix, and it may be a lost effort to try to blend them. If we are forced to admit there is no correlation between the two specialties sufficiently great to encourage one specialty to listen to the papers given by the other, the next question is: What kind of papers should be given by the orthodontic portion of the section and what is supposed to be accomplished? If the orthodontic papers are to be of interest to the general practitioner and serve as a means of promoting orthodontic information, they should be selected for that purpose; but even if so selected, they would probably be a failure, because general practitioners will not attend the orthodontic section. Some may say that the papers read on orthodontia are published in the *National Dental Journal* and that the general practitioners read them; but as a matter of inquiry, we find general practitioners do not read orthodontic papers published in general dental journals. Experience has proved that the papers read before the orthodontic section are very likely to be published in the *National Dental Journal* a year or sixteen months after the paper was read, which very often results in the paper becoming ancient history and the author even forgetting that he had ever written such a paper. Again, if the papers that are read on orthodontia are not of interest to the general practitioner, they should deal with subjects in which the specialist is interested.

Papers should not be read which have been presented before other orthodontic societies and which do not contain any new ideas. They destroy the interest in the section. For instance, the majority of orthodontists who listened to the papers in the orthodontic section expressed the opinion that they would never

attend another meeting, because of the nature of the papers that were presented; namely, one of the papers dealt with the clinic which was given before the National Dental Association in the meeting at Chicago; another was a re-hash of a paper dealing with the same subject that was presented before the American Society of Orthodontists at St. Louis, which had been published in several different dental journals, and with which all orthodontists were familiar, and had formed such fixed opinions that few even consented to discuss the paper. It may be said that those papers were presented for the benefit of the periodontists, but the periodontists as a whole, with the exception of a very few that were forced to stay, did not listen to the last paper.

Another paper was a presentation on regulating appliances which especially featured one that the majority of the orthodontists have already condemned or at least have formed their opinion of, and nothing in the paper was presented which would in any way make them change their minds. In fact all of the papers, except one, was a presentation of material that had been given at various times and was not even new or interesting. This left only the one paper by Dr. Casto which contained anything of particular interest to specialists, and those things that were interesting: namely, the impaction of deciduous molars, was not even mentioned in the title of the paper. All specialists of orthodontia are already convinced of the necessity of oral prophylaxis and radiography in the practice of orthodontia.

Coming back again to the original suggestion and the possible reason for the formation of the section on orthodontia and periodontia: namely, that papers should be read which were of interest to both sections, we can only say that it requires a firm conviction that he is right for a man to present a paper before the section of orthodontia and periodontia which features an appliance using a large number of bands upon the anterior teeth, considering the fact that periodontists have for a number of years accused orthodontists of producing all sorts of gingival ills to the teeth, and with causing all kinds of pathologic conditions by the use of bands upon the teeth during the treatment of malocclusion. We are aware of the fact that there are bands and "different kinds of bands," but we also know that, regardless of how beautiful a band may be fitted to a tooth, how accurately it may conform to the anatomic shape, the very nature of the tooth makes any band more or less of an irritation to the soft tissue. Even if the band does not come in contact with the soft tissue, there is the edge that is going to collect a certain amount of debris and a few million of bacteria which always remains a source of danger to the tooth for some time; it will not be properly brushed, and trouble is going to start. Therefore, from a periodontic standpoint, we should try to get away from bands, and not insult the intelligence of a periodontic audience by forcing upon them a regulating appliance that they have condemned years ago.

After the meeting of the section of orthodontia and periodontia, we interviewed considerably over half the number of orthodontists present, and all of them expressed the opinion that they thought they would never attend another meeting of that section; therefore if the section is to appeal to the orthodontic specialist, it will have to appeal by the presentation of a different group of papers

than have been presented at the last two meetings. Furthermore, if the orthodontic papers are to appeal to the periodontists, they will have to be different papers than those presented at the New Orleans meeting. Both the orthodontists and periodontists should take lessons in common courtesy, so they will not be so rude as to leave the room when the papers are being read by members of the specialty to which they do not belong. Members of each of the specialties were guilty of rudeness, and probably the greater blame belongs to the orthodontists, because at the Tuesday meeting, they walked out while the papers on periodontia were being read; and consequently it necessarily followed as a result of an inherited trait which is present in a large number of individuals, "Do Unto Others As You Are Done To," the periodontists acted on Wednesday the same as the orthodontists did on Tuesday.

The meeting of the section, from the viewpoint of an observer, also based on information which was obtained from a number of orthodontists, was a weak affair from an orthodontic standpoint. So far as the success of the section as a whole is concerned, the first question is: Can orthodontia and periodontia be linked together so as to work for the good of both specialties, the good of each other, and the dental profession in general? At the present time, we do not believe that the two specialties have enough in common to enable them to be jointly interested in a two day meeting. Then the only two other things that remain for the orthodontic section is to decide whether it is going to try to educate and interest the general profession in orthodontic matters, which also looks hopeless to us, because general practitioners will not attend an orthodontic section meeting, or whether the orthodontic section is to run for the advancement of orthodontists and the interest of the specialists. The last is going to be a difficult problem because any man who has an orthodontic subject which is of interest to the specialist will prefer to present it to a larger body, where he will have a more representative audience that is interested in orthodontia. We believe the officers of the section of orthodontia and periodontia have a very great problem before them, and the next two meetings will decide whether the section is to be a success and accomplish some good as it is now organized, or whether it will never accomplish anything.



## ORTHODONTIC NEWS AND NOTES

Doctor A. LeRoy Johnson has announced the removal of his office for the exclusive practice of orthodontia from Springfield, Mass., to 19 Bay State Road, Boston, Mass.

Doctor Raymond R. McDaniel announces the opening of offices for the practice of orthodontia at 725-726 First National Bank Building, Birmingham, Alabama.

Doctor I. W. Bull announces the opening of his offices at 414 St. James Building in Jacksonville, Florida, for the exclusive practice of orthodontia.

### Obituary

The death of Dr. Newell Sill Jenkins, of New Haven, Connecticut, occurred at Havre, France, the twenty-fifth day of September, 1919. The doctor was in his seventy-ninth year, and for fifty years occupied a prominent position in the dental profession, both in this country and abroad. He sailed from New York on the steamship *La France* on the eighteenth day of September, with the idea of spending the winter in Southern France, believing the climate would be beneficial to his failing health. Dr. Jenkins had a host of friends in the dental profession both here and abroad, and his death is indeed a great loss.

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The editors desire to inaugurate this department in the Journal, but in order to do so must have the full support of the orthodontic profession throughout the country. We would deem it a great favor if our subscribers and readers would send in such announcements as might be of interest to the profession.

# The International Journal of Orthodontia and Oral Surgery

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## ORIGINAL ARTICLES

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### ANCHORAGE AND ATTACHMENT

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BY MARTIN DEWEY, M.D., D.D.S., CHICAGO, ILL.

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A REGULATING appliance is a mechanical device for exerting pressure upon a malposed tooth. In order to accomplish the result desired in orthodontic work, two important conditions must be considered, namely; the resistance which is to overcome the force and the point of attachment to the tooth where the force is to be delivered.

The resistance to overcome the force exerted by the regulating appliance is termed "anchorage." After the proper construction of a regulating appliance and the selection of the anchorage, there must be a suitable point of attachment in order that the force may accomplish some definite purpose. Considering the fact that anchorage is resistance to overcome an applied force, the point of attachment of the appliance to the malposed teeth is an entirely different matter and should not be confused with the anchorage or classified as being an anchorage, as has been done by some.

It is true that a regulating appliance must be attached to the point of resistance, and must also be attached to the malposed tooth in order that the force may be properly utilized. However, the resistance is an entirely different thing from the attachment, although in certain forms of construction of regulating appliances, the means of attachment of the parts of the appliances to the anchor tooth may mechanically increase the resistance of the anchorage. Anchorage has been classified in various groups, first as *intra-oral* and *extra-oral* anchorage, which forms are designated by the resistance being selected, either from a point inside or outside of the oral cavity. Intra-oral anchorage is later divided into *intramaxillary* and *intermaxillary* anchorage, depending upon whether the resistance is in the same arch as the malposed tooth or whether the resistance is in the opposite arch from the malposed tooth. These anchorages

can be further classified according to mechanical construction as *simple anchorage* and *stationary anchorage*.

Simple anchorage is that form, in which the resistance is obtained from purely anatomic conditions, such as the size, and favorable location of the anchor tooth to which the appliance is attached. Fig. 1 may be considered as an example of *simple anchorage*, because the resistance to the regulating appliance is obtained from a canine and premolars. A large number of teeth have been pitted against one tooth supposing that the greater number of teeth would exert sufficient resistance to overcome the force necessary to produce such cell activity around the malposed tooth as would allow it to assume a normal position. In simple anchorage, we depend entirely upon the anatomic surroundings of the teeth selected as points of resistance, and do not construct our regulating appliance with the view of assisting those teeth whatsoever.

Stationary anchorage is that form in which the resistance necessary to overcome the force exerted on the malposed tooth is obtained by so constructing and attaching the appliance that if the anchor tooth moves at all, it must be moved bodily through the process. As a matter of comparison, in stationary

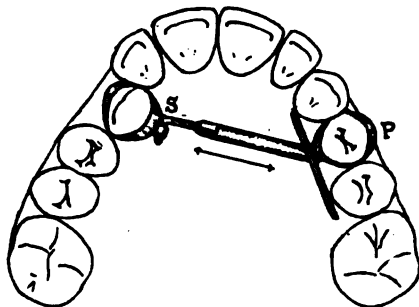


Fig. 1.  
(After Pullen.)

anchorage the appliance must possess two things that are not necessary in simple anchorage; it must be so constructed and attached to the anchor tooth that if the anchor tooth moves at all it must move bodily. Stationary anchorage possesses the mechanical conditions which I have outlined plus the anatomic factors which obtain in simple anchorage. In simple anchorage the attachment to the anchor tooth may be of a pivotal nature, and as a result the term "pivotal anchorage"<sup>2</sup> has been suggested in place of simple anchorage. The one objection to the term "pivotal anchorage" is that it immediately confuses attachment with anchorage, which is a thing that should be considered separately. That is, terms should not be used synonymously, because anchorage and attachment are two different things. It is true that certain attachments will increase the anatomic resistance, but it is equally true that we must have an attachment to the malposed tooth, which I believe should not be confused with anchorage, and which should not be termed "secondary anchorage."

In order to obtain stationary anchorage, it is necessary that we consider more than the form of attachment.<sup>2</sup> To change an attachment from a pivotal to a nonpivotal one does not make stationary anchorage, for in addition to the

attachment there must be a rigid construction of the appliance. A great many unsatisfactory conditions have resulted in the practice of orthodontics through the belief that the attachment of the appliance was all that was necessary in order to secure stationary anchorage. Such attachment as shown in Fig. 2, which is of the nonpivotal variety, does not necessarily make stationary anchorage, and in the majority of cases is not stationary anchorage. It is only a non-pivotal form of attachment, for the construction of the appliance is not rigid enough to make stationary anchorage. The alignment wire, whether it is used as a labial or lingual appliance, is often of such small gauge and so elastic that the appliance will bend between the anchorage and the point of attachment to the malposed tooth, which in turn will allow the anchor tooth to tip, thereby

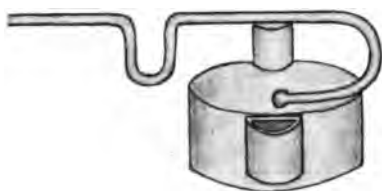


Fig. 2.  
(After Pullen.)



Fig. 3.  
(After Pullen.)



Fig. 4.  
(After Pullen.)

giving only a simple anchorage. Fig. 2 shows a nonpivotal form of attachment, but the second mechanical necessity for stationary anchorage is missing—the rigidity of construction.

In Fig. 3 perpendicular tubes are used on the lingual side of the molar bands, and if these tubes are half-round it will be a nonpivotal attachment in all directions, but it will not be a stationary anchorage. If sufficient force is exerted upon the malposed teeth to overcome the anatomic resistance offered by the anchor teeth, the anchor teeth will necessarily tip because no provision has been made to maintain a certain definite relation of the anterior portion of the alignment wire with the malposed teeth. In Fig. 4 is shown a similar attachment to the molar bands and bands have been placed on the malposed teeth with such attachment as to maintain the anterior portion of the lingual alignment

wire and a definite relation to the malposed teeth. However, this means of attachment to the anchor teeth and to the malposed teeth does not make stationary anchorage, unless the lingual alignment wire is sufficiently rigid and stiff to prevent any bending or spring between the anchor teeth and the malposed teeth. A large number of undesirable results have occurred in the treatment of malocclusion where men have tried to use stationary anchorage, and they have been led astray by believing that nonpivotal attachments were all that were necessary for the production of stationary anchorage. The second mechanical feature: rigidity of the appliance is necessary, which means the appliance must be sufficiently rigid that there will be no spring or bend between the anchor tooth and the point of attachment to the malposed teeth. Such appliances as shown in Fig. 5, where the labial alignment wire is a small gauge elastic wire, do not give stationary anchorage, because the wire is not rigid enough to prevent spring-

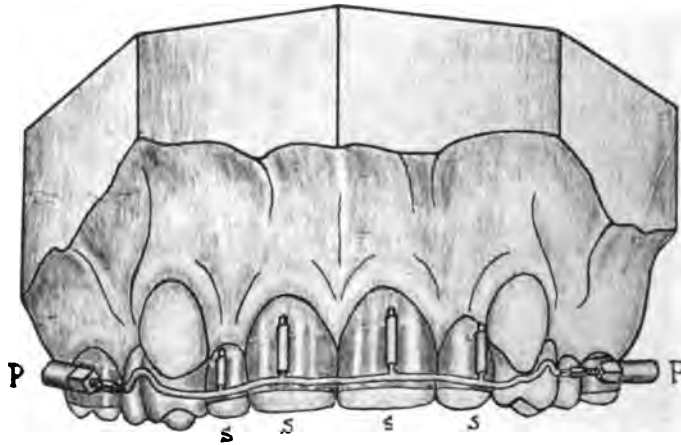


Fig. 5.  
(After Pullen.)

ing or bending between the anchor teeth and the point of attachment to the malposed teeth. For that reason it becomes necessary to consider and make a distinction between anchorage and forms of attachment, because they are not the same thing, consequently a nonpivotal attachment upon an anchor tooth does not necessarily give a stationary anchorage. Stationary anchorage can only be obtained by the two mechanical features, attachment and rigidity of construction.

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## A CONSIDERATION OF NORMAL ARCH FORM AND SOME OF THE METHODS OF DETERMINING IT\*

BY JAMES DAVID MCCOY, B.S., D.D.S., LOS ANGELES, CAL.

*Professor of Orthodontia and Radiography, College of Dentistry, University of  
Southern California*

### Part I

AT the mere mention of normal occlusion there is produced in the mind of every student of anatomy a vivid picture of the relationship between the two arches which the term implies, as well as the general contour of the individual arches and the necessary interrelation of the opposing teeth. It would seem therefore it should not be difficult to state in exact terms just what constitutes normal arch form.

Simple as it may seem at the outset, the task of formulating such a definition is beset with numerous difficulties, a fact which is proved by the wide variance of opinion expressed by many studious observers. If we are to consider the subject from a practical standpoint, we are primarily interested in knowing what the relative shape and proportions of the normal dental arch should be in healthy, well-developed Americans, as they are the people with whom we are coming in daily contact, and it is such arches which we must attempt to reproduce in our restorative work.

This point should be carefully borne in mind, for if we follow the trend of thought of the anthropologist or the comparative anatomist we are apt to become confused in a discussion invoked by a consideration of arches found in ancient skulls, in variations of different so-called types, and, strange as it may seem, in races far removed from our field of activity.

Characteristic of the attitude of the anthropologist upon this subject I wish to quote from the writings of Dr. Ales Hrdlicka, Curator of the Division of Physical Anthropology, United States National Museum, Washington, D. C. In discussing the normal dental arch, he says:

"Under ordinary conditions of the skull and jaws, a normal dental arch is the arch of the normal set of teeth. Unless otherwise interfered with, the arch is what the teeth have made of it."

In speaking of what he terms "normal variations," he says:

"The Dolicho-uranc type of arch—a term given by Sir William Turner—is that type in which the relation of the external breadth of the arch to its length, in other words, the arch index, is less than 110. The meso-uranc type embraces the arches with indices between 110 and 115; and the brachy-uranc, those in which the index is above 115. The brachy-uranc arches are relatively broad and short normal arches, the meso-uranc may be termed medium, while the dolicho-uranc are relatively long and narrow. There exists then, quite an extent of variation in the relative dimensions alone of the normal arch; in fact,

\*Read before the Sixth Annual Meeting of the Pacific Coast Society of Orthodontia, May 13, 1919.

when we take enough cases, we find that the variation in the arch index among strictly normal arches will range from about 90 to 150. In other words, we find instances in which the external breadth is only about nine-tenths of the length of the arch, and others in which it will reach as much as fifteen-sixteenths. This great variety in normal arches may in fact be found in one and the same race, such as the whites or Indians."

In his conclusion he says:

"The main object of these remarks was to emphasize the fact that there is no such thing in existence, in any race that we know of, as one single normal dental arch; that in every race and even under most normal conditions, we find a variety of arches which must be considered as normal arches, and it will be the duty, it seems, of the dental surgeons of the future to pay close attention to these facts, because they can not but have a direct bearing on the intelligent treatment of patients."

If we are to accept the views of the anthropologist as applying literally to the people who come to us daily for help, most of us, if we are honest, must be overwhelmed with the responsibility of reproducing in this or that individual the type of arch to which he or she is entitled. The outlook would indeed be

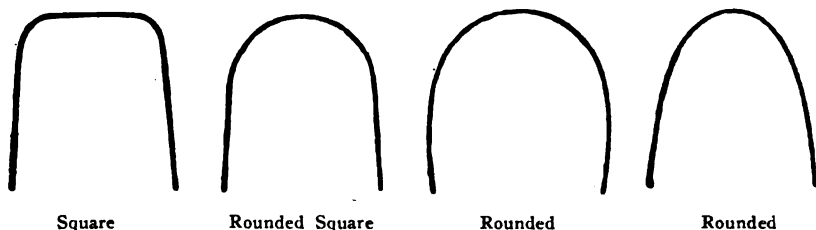


Fig. 1.—The main types of the dental arch.

gloomy if he did not leave us one ray of hope, viz., he says at the outset, "Under ordinary conditions of the skull and jaws, a normal dental arch is the arch of the normal set of teeth. Unless otherwise interfered with the arch is what the teeth have made of it."

While this statement was not intended to give anything definite, it adds weight to evidence which will be presented later on and therefore should be borne in mind.

The late A. H. Thompson, in his book on *Comparative Dental Anatomy* gives us a result of his extensive observations, the following typical arch forms (Fig. 1): The square arch he says, "is found usually in persons of strong osseous organizations of Scotch or Irish descent, i.e, Gaelic extraction. The rounded square is the medium arch usually found in ordinary, well-developed Americans. The rounded arch is quite characteristic in some races, as the brachycephalic South Germans. The rounded V is the arch of beauty and that most admired in women of the Latin races."

Thompson's observations give us hope of arriving at something definite, for he says, "The rounded square or medium arch is usually found in the ordinary, well-developed Americans."

Bonwill, in his work on the articulation of the teeth examined as he says 4000 dentures in living persons and 6000 skulls and from these observations established as a standard an arch based on the equilateral triangle and conforming closely to the most perfect arches found. This arch (Fig. 2) is not exactly the form of any of the types illustrated by Thompson, but seems to be a combination of the rounded square and the rounded V, as might be expected, when we consider that Thompson is presenting what he considered distinct racial types and Bonwill, an ideal selected from the most perfect dentures found in his investigations.

While Bonwill's efforts were for the most part put forth in an effort to solve some of the mechanical problems of occlusion as they apply to prosthetic dentistry, he unquestionably realized the necessity for a definite idea of what constituted normal arch form as it applies to modern man.

If we attempt to assume that there is a more or less definite arch form which can be claimed as characteristic of the American people we are at once con-

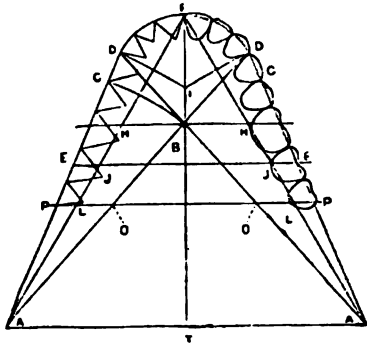


Fig. 2.—Bonwill's conception of the ideal dental arch.

fronted by the stumbling block so frequently occurring in our literature upon the subject; viz., "that the arches vary according to the type." If this is literally true we are still left floundering about in a maze so confusing that the average student is at a loss to know in which direction to turn, for we are without any very definite information as to how these various types are to be determined.

As an illustration of the truth of this statement, I wish to cite an experiment carried out by Percy Norman Williams.

Realizing that there were many conflicting opinions as to the shape of the arch, with a total absence of definite laws or standards, he endeavored to learn whether there was such a thing as uniformity of opinion. Securing a photograph of an individual who possessed natural normal occlusion (Fig. 3), he measured the teeth, noted their arrangement carefully, and secured duplicate sets in artificial teeth. He then wrote to ten well-known men in the profession, sending each one a photograph of the subject of the experiment, an upper model with the teeth removed, and one of the duplicate sets of artificial teeth. "He requested these men to set these teeth up upon the model, shaping the arch as they thought it should be to harmonize with the face of the patient. He asked that



they disregard length of bite, compensating curve, etc., as all he wished was their idea of the form of the arch which would be correct for the type represented.

Several interesting and widely different opinions were expressed; some declining, saying it was impossible to determine the shape of an arch for a given type. Fig. 4 shows some arches received.



Fig. 3.—Showing the type submitted to various dental authorities, together with models of the subject's teeth.

It is obvious from the results obtained that the arches submitted were not constructed in accordance with any fixed law, but rather to conform with the individual ideas of the different experts. *That this lack of a definite idea of what really constitutes normal arch form is one of the most grievous shortcomings of dentistry should be apparent to every studious observer.* If we attempt to do for our patients restorative operations involving arch form upon the assumption that we are able to successfully do our work without some tangible law or plan, we certainly risk the accusation of either egotism or ignorance.

It might be done and no doubt has been done successfully by some few who were endowed with a deep understanding of art and anatomy, but how many of us can justly lay claim to such accomplishments?

Evidence to the contrary is to be found on every hand, if we but observe carefully the average person wearing a full upper and lower denture, or take note of mouths which have been submitted to the vagaries of hit or miss orthodontia. It would be difficult to say which branch represents the greater number of sins, but safe to say that numerous crimes have been and are being committed in the name of each. As an example of the lack of definite laws pertaining to the subject, I wish to quote from the well-known authority, Angle. In the seventh edition of his book he says:

"That we should have a line from which to note variations from the normal in the position of the teeth is important, but that its meaning is deeper and that it has a far greater significance to the student of orthodontia than above indi-

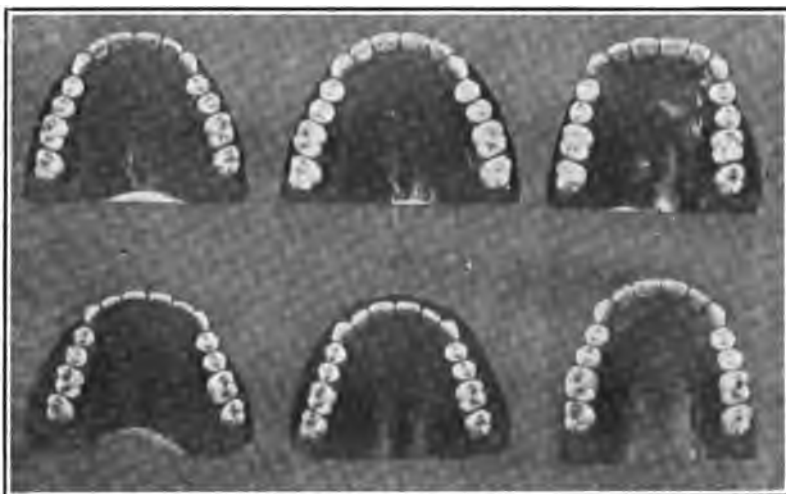


Fig. 4.—Showing teeth arranged by several dental authorities.

cated, the writer is fully convinced." In the sixth edition of this work he used the term "the line of occlusion" which he defined as being "the line of greatest normal occlusal contact." Yet after a much greater consideration of the subject he believes this definition though more nearly expressing the true condition than the terms previously employed is still inadequate and he would now define it as being "the line with which in form and position according to type the teeth must be in harmony if in normal occlusion.

"There can be then but one true line of occlusion and it must be the same as the architectural line on which the dental apparatus was constructed. This ideal line was intended to govern not only the length, breadth, and peculiar curve of the dental arches, but the size and pattern of each tooth, cusp, and inclined plane composing these arches. And more than this; that as the dental apparatus is only a part of the great structure, the human body, each part and organ of which was fashioned according to lines of design, it must have been intended that the line of occlusion should be in harmony in form and position with and in

proper relation to all other parts of the great structure according to the inherited type of the individual. Hence, its majesty, and according to our conception of it must be our ability to comprehend not only the arch requirements in each case we treat, but as well must it govern our conception of the requirements of the teeth in occlusion and the various operations in treatment. The line of occlusion then, is more than the tangible or material. It may be regarded as the basic ideal of the dental apparatus, the comprehension and appreciation of which will grow in proportion as our knowledge of the science of occlusion unfolds.

"This line describes more or less of a parabolic curve, and varies within the limits of the normal, according to the race, type, temperament, etc., of the individual. It is difficult to determine exactly what the form of this line should be in each given case."

So again we are left without anything tangible or definite as to the form of the normal arch for this distinguished writer's defining of the line of occlusion is too ethereal and hypothetical to be formulated into definite form.

More than one writer on dental anatomy has attempted to classify the teeth and dental arches according to so-called temperament and four typical basal temperaments are usually described. These are known as, "Bilious," "Nervous," "Sanguine," and "Lymphatic." Under these headings, dental arches are usually described in more or less definite terms, giving the form of the teeth, the character of curvature of the line of occlusion, length of overbite, etc.

If this classification could be accepted we might be in a position to arrive at something vaguely definite as to a classification of arch forms, but, unfortunately, it can not be accepted as it is founded upon assumptions which are not in accordance with real facts, therefore one formidable barrier which has ever stood in the way of coming to a definite conclusion as to what constitutes normal arch form should no longer be considered a barrier. I would not expect you to accept this statement if it were based solely upon my own observations, so I shall present evidence in proof which comes from sources which can not be lightly considered.

The eminent scholar, J. Leon Williams, in his book *A New Classification of Natural and Artificial Teeth*, has among other things discussed in a manner both thorough and accurate the question of temperamental forms of teeth. If we admit, as we must, that one of the chief corner stones of the theory that, "The arches vary according to type," was the acceptance of the idea that there are distinct temperamental and racial forms of teeth, and that nature always produces teeth in harmony with face and feature, we must realize that if this important part of the foundation be suddenly removed the whole superstructure must painfully sag or collapse.

Before proceeding with the discussion of the temperamental theory, I wish to again call your attention to the definition of normal arch form given by the anthropologist, for while it is not definite, it should be borne in mind as it has an important bearing upon the conclusions which I shall ask you to consider later. "Under ordinary conditions of the skull and jaws, a normal dental arch is the arch of the normal set of teeth. Unless otherwise interfered with, the arch is what the teeth have made it."

## Part II

In his discussion of the "Temperamental Theory" Williams says in part:

"You will I think be able to see more clearly the relation and significance of the facts presented if I state specifically the main objects I have in view in this paper. I shall attempt to destroy all belief in temperamental forms of teeth, for I regard this as one of the most fundamental errors in the present system. I shall try to show that while there are slight variations in the teeth of different peoples, there is no such thing as racial types of teeth. I hope to convince you that the oft-repeated statement that Nature always produces teeth in harmony with face and feature is a mistake due to lack of careful observation.

"One writer on the subject of temperament says: 'In these temperamental differences, no single sign is more significant than is to be found in the physical characteristics of the teeth—their size, shape, color, density and alignment be-



Fig. 5.—Two skulls of unlike form with teeth identical in type and size. No relation between form or size of skull and the form or size of teeth.

ing as much an index as is the distinctive complexion, the color of the eyes, hair, etc.' A little farther down the page it is said: 'The law of harmony thus found in nature between the teeth and other physical characteristics requires,' etc., etc., and once more: 'The careful observation and recording of these co-relations would go far toward making prosthetic dentistry an exact science.' Here we have three variations of an assumption that Nature always produces teeth that in form and size are in perfect harmony with the face and the individual features of the face. We often meet this assumption in our textbooks and in magazine articles. On what is it founded?

"Let me put a few of the facts bearing on this question before you. Here is a photograph of two skulls (Fig. 5). You will observe that the difference in general contour is very marked. But the teeth you see, are identical in size and type. If either set is in perfect harmony with size and contour of face, the other set can not possibly be so.

"Here are two more (Fig. 6), a very wide and a very narrow skull. Think

what a striking difference there must have been in the facial contour of the two individuals those skulls represent. But you see the widest and shortest teeth are in the long narrow skull. And here (lower pictures in illustration) are two more from the Andaman Island, both skulls from the same race. Here again the smaller skull has the larger teeth. Note also that they are not of a different type.

"Here we have four skulls" (Fig. 7) so nearly alike in size and contour that a single set of teeth would be just as suitable for one as for another of them, but look at the difference in the natural teeth. At least three of those must be



Fig. 6.—(Upper.) The widest and shortest teeth are in the narrow skull. (Lower.) Two skulls from the Adaman Islands. The smaller skull has the larger teeth and of a different type, than the other.

examples of disharmony. A glance at the teeth is sufficient to demonstrate the mistakes of nature. I could take up the whole evening in showing you examples of this sort, but as further proof on this point will appear incidentally when I am considering other phases of my subject, I will not dwell longer on it now. Unless some one can advance good and satisfactory reasons for believing that Nature is more solicitous about the harmonious relations of our dental organs with other features than she is about those of our eyes, ears or nose, we will conclude that the subject is always open to the intelligent criticism of an artist in teeth.

"Who has ever got together even a dozen peoples of one temperament, selecting them by their alleged physical temperamental peculiarities without looking at their teeth and then examine the teeth to see if they were all alike or of one type? If that simple experiment had ever been made it would have been seen that this pretentious structure (the temperamental theory) is as frail as a house of cards and as empty as a soap bubble.

"And now let me lay before you the final and crushing proofs of the utter futility and fallacy of this theory.

"What is the origin of those physical characteristics that are called temperamental?" You have all seen pictures from life which represented the three



Fig. 7.—Four skulls of same type, but with very dissimilar teeth.

great races from which it is believed all the modern peoples of the earth have arisen; viz., the black race, the yellow or Mongolian, and the Caucasian race, and you are all familiar with the three distinct types of skulls, long, broad, and medium, which are considered most characteristic of these distinct races.

"Away back in neolithic, or even in the paleolithic times, there were two races in Europe—the long headed or dolichocephalic type, and the broad or round heads, the brachycephalic type.

"The Caucasian race is, possibly, a later evolutionary development. Broadly speaking, the fair races, and, to a large extent, the yellow races, are found in Northern and Central Europe and Asia, while the darker races occupy the equa-

torial and Southern regions. From the mingling of those light and dark races, the working of the principle of variation, and the modifying effects of climate and general environment, there has arisen all the racial or temperamental characters that the widely varied inhabitants of the earth exhibit. There are many theories and there is much speculation about these ancient races, but all theories and all known facts are in agreement on the point of the meeting and mixing of dolichocephalic and brachycephalic races in Europe in prehistoric times.

"The mixed temperaments are simply the result of mingling of the blood of different races, somewhat modified, in the event of migration by changed environment. If, therefore, there is such a thing as a sanguine type of tooth, or a bilious type of tooth, they must have originated in the sanguine and bilious races. If there are special characteristic temperamental forms of teeth, there must have been racial forms from which they were derived. There is no possibility of evading the logic of that conclusion. And I think it has always been assumed by our profession that there are racial forms of teeth. I think you will find many references in our literature to this supposed fact. Now a racial form of tooth must mean a distinctive form peculiar to a race. But if I am able to show you that there is no such thing as a racial form of tooth, if I can prove

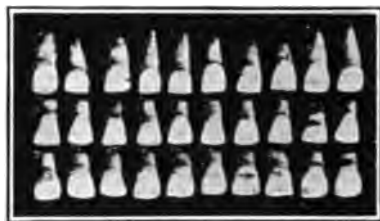


Fig. 8.—Three classes of centrals. Class 1, upper row; class 2, middle row; class 3, lower row.

beyond all possibility of a doubt that there are certain primary forms of teeth which are in their general type characteristics common to all races light and dark, ancient and modern, and savage and civilized, then I submit that even the unreasonable minority will have to agree that all belief in a temperamental type of tooth must go.

"There are certain differences as to size and small differences in proportion of width to length in teeth of the same general type in different races. But as to essential differences in type there are none.

"Let us now examine in detail the proofs of the statements that Nature produces three typical forms of teeth in all races and modeled all teeth upon these three. You have on the screen a photograph (Fig. 8) representing a small but representative selection of the three primary forms or types of human teeth. In all reference to them they will be designated as Class I, II, and III. Class I is characterized by the parallel or nearly parallel lines which represent the proximal surfaces of these teeth for half or more than half of their length from their incisal edge. In Class II these lines converge so markedly that they would meet in most instances at a point near the end of the root. These converging lines are sometimes nearly straight, but usually there is a very slight convexity of the mesio-proximal surface and a slight concavity of the distal surface. Class III,

which I regard as the most beautiful form of human teeth, and which has rarely if ever before been used as a model for artificial teeth, is characterized by a delicate double curved line on its disto-proximal surface and sometimes, though less frequently, on the mesial surface. All of the surfaces and angles of teeth of this class are more rounded and graceful than in either of the other two classes. The specimens shown in this photograph represent the most severe or typical shapes of what I call the primitive forms of human teeth. My reason for the use of the word 'Primitive' will appear later. All of the other teeth in any given set partake of the features of the central incisors, but to a much less marked degree. But in this respect the natural teeth of a given set are not always in harmony. The crossing of races or some other cause often disturbs the perfect harmony of line of the different teeth in a set, and you may sometimes find centrals of one class and laterals and canines of another, but usually the harmony is more or less perfectly preserved. In designing artificial teeth we can, of course, *always* maintain a proper harmony throughout and thus improve on Nature. The succeeding photographs will show you laterals (Fig. 9) and canines arranged in the order of the three classes. As I have intimated, the class characteristics are not so marked in these teeth as in the centrals, but you will have



Fig. 9.—Three classes of laterals arranged like centrals in Fig. 8.

no difficulty in seeing in any of the groups something of the special features of each type. In this photograph you see the effects of crossing the types. There is more or less blending of the primitive forms, although in nearly every instance the dominance of one type or another can be perceived. Probably the majority of teeth in all mixed races are of this character.

"We will now pass to an examination of the teeth of some of the more important civilized and savage races of ancient and modern times, in which I shall show you that the three types or classes of teeth I have illustrated and described are to be seen in the skulls of all these otherwise widely divergent peoples. In this first exhibit the skulls will all be shown in groups of three, thus presenting in one view the three primitive forms of teeth in each race. We will begin with three skulls from a savage race of today—the Sandwich Islanders (Fig. 10). The shape of the skulls differ markedly, but this difference in skull shape has no necessary relation to the different forms of teeth. We have here the three primary forms of human teeth very clearly shown. We have square teeth with parallel sides in skull No. 1, the pyramidal-shaped tooth with its converging lines in No. 2, and an ideal specimen of Class III, with its beautiful curves in skull No. 3.

"As you would expect, not all the teeth in the different groups of skulls which I shall exhibit are such perfect examples of the severer forms of the three classes.



Probably perfect examples could always be found if one had a sufficiently large number of skulls at command. The surprising thing is that even in a small collection of skulls, often less than a dozen, I have always been able to find fairly good representatives of the three classes, but I believe that the more severe typal forms are more frequently found in those races in which there has been the least crossing.

"A group from the Fiji Islands (lower portion of Fig. 10). Please observe that while the teeth are not all good examples of the primary forms of their



Fig. 10.

class, yet the variation in form is so great as to completely upset the theory of a racial type of tooth.

"The next two and three groups of skulls are in some ways the most interesting in the entire collection shown you tonight. The natives of Australia (upper part of Fig. 11), Tasmania (center of Fig. 11) and New South Wales represent the lowest type of human being of modern times. The skulls of these savages have many points of resemblance to the Anthropoid Apes. Here, if anywhere, you might expect to find a racial form of tooth. But just observe the difference in the shape of these skulls and teeth. With the exception of the teeth of the ancient Egyptians, these low Australian savages exhibit the characteristics of the three primitive forms or types of teeth more clearly than

any other in the groups I have shown. No. 3 is, I believe, regarded as one of the greatest anatomical treasures of the Museum of the Royal College of Surgeons. It probably shows a more intimate relationship with the Anthropoid Apes than any other modern skull. It was received from Australia just as I was finishing this work of investigation, and was photographed for the first time for me.

"The last group in this series that I shall show you (lower row of Fig 11) is



Fig. 11.—Upper group: Natives of Australia. Center group: Natives of Tasmania.  
Lower group: Ancient Egyptians.

from that very interesting ancient race, the Egyptians of the third and fourth dynasties, the period dating more than two thousand years before Moses led the children of Israel out of Egypt. We are back in the bronze age at the dawn of what we call civilization, the time of the Troy, of the Iliad, and before the Great Pyramid was built. It was a piece of great good fortune to have found three such perfect skulls from this far distant era, showing so perfectly the three primary types of teeth. They are each ideal specimens of their class. The teeth in skull No. 1

answer perfectly to the description given in our textbooks of the sanguine types of tooth, but I believe all authorities are agreed that those ancient Egyptians did not have light hair or blue eyes or a ruddy light skin. There is evidently a mistake somewhere, perhaps it is a fault of the Egyptians. But the forms of teeth shown in the other two skulls have never been observed by any advocate of the temperamental theory of classification. New temperaments will have to be invented for them.

"Suppose the teeth in all three of these skulls had been, as might easily have



Fig. 12.—Nine skulls of different races and unlike size and contour, all with teeth of class I. The form and size of the teeth bear no relation to the form or size of the skull. Nationalities from left to right are: Spanish, Sandwich Islanders, New Hebridean, German, Javanese, Hindoo, Figi Islander, Itobian, Ancient Egyptian.

happened, of Type I, a strong tooth full of character. Would it not have been said that here was a typical racial tooth form of the ancient Egyptians? This mistake concerning racial types of teeth has grown out of insufficient critical observation.

(Fig. 12.) "During life the individuals which these skulls represent must have presented a great variety of facial contours, but observe how many of the central incisors in these varying skulls are alike or nearly so. Look at the upper

row of skulls. The teeth are identical in type and nearly so in size. But what a contrast in the skulls, especially in 1448 and 398, and again you see the smaller skull has slightly larger teeth.

"Again I say the proof that Nature produces no perfect harmonies of relationship in the different parts of organisms is to be seen on every hand. It is before our eyes all the time.

"More than that I will say that any one who will take the trouble to examine and compare forty or fifty skulls from almost any race, will be forced to the conclusion that if he wishes to follow Nature blindly in the matter of adapting teeth to facial contour, he has a fairly wide range of choice in making his selection. It would probably express an important truth to say that Nature seems to be always striving to reach or realize harmony, but rarely achieving a perfect success and sometimes going very wide of the mark. *The great variety of inconsistencies in Nature emphasizes in a most striking manner the paramount importance of finding some fixed principle of harmony between tooth form and facial contour. Art supplies us with that which Nature has failed to give us. What we have to do is to study closely the majority of instances in which an approximation to harmony is seen, and from the knowledge thus gained to deduce the general principles on which the highest possible degree may be based.*

"The one important fact we have established up to this point is that there are three types of teeth common to all races.

"I have no need to labor this point of identity of tooth form in different races or to press for conclusions in the least, beyond what the facts will fully warrant, but I submit that I have destroyed the last vestige of a belief in a racial type of tooth. And along with the passing of that belief there must disappear also the theory of a temperamental type of tooth. *My summary of the whole matter is this: That as a working theory it has always been so vague in statement and indeterminate in application that it has never taken any serious hold upon dentists and is practically a dead letter with more than nine-tenths of the profession, that to teach a theory which no one really practices or understands is immoral because it leads directly to a disbelief in any scientific basis for prosthetic dentistry; that if there had ever been any real desire to undertake a practical application of the theory, it would not have been possible to do so, and lastly that the theory has absolutely no foundation in scientific fact because it is fully incontrovertibly demonstrated that any given forms of teeth are not peculiar to any race, neither do they bear any necessary relation to the shapes or sizes of skulls.*"

### Part III

In this discussion of arch form, it should be borne in mind that we are considering arch form alone and not the relationship which the arches bear to the rest of the skull. This is important, for unless this point is clearly emphasized, our vision is apt to become clouded and confused by instances of prognathous arches which at first sight might be construed as being architecturally entirely different from what we consider as being normal. A favorite example of such an arch quite popular with the exponents of the "variations according to type" theory is the Fan Tribe of West Africa (Fig. 13). Even if such arches should prove to be different, they should not materially affect our conclusion, for probably

none of us will ever be called upon to do restorative work for members of the Fan Tribe of West Africa, or will we care to reproduce in our patients such an occlusion. Even those who still cling to the theory of type and temperament must admit that our interest is centered upon arch form as we see it in normal, well-developed Americans. Before going into details as to the architecture of such arches it will be interesting to note the opinions of some well-known authorities who apparently are reasonably in agreement upon certain phases of arch form which are of interest to us.

(Broomell) "The teeth are arranged in the jaws in the form of two parabolic curves, the superior arch describing the segment of a larger circle than the inferior, as a result of which the upper teeth slightly overhang the lower."

(Gysi) "The arches have the form of a parabolic curve, the incisors and canines of both arches form part of the arc of a circle."

(Talbot) "In the skull, in taking the two cuspids for the starting point the arc of a circle is found."

(Black) "The upper teeth are arranged in the form of a semi-ellipse, the



Fig. 13.—Fan Tribe, West Africa.

long axis passing between the central incisors; occasionally the molars and bicuspid form a straight line instead of a curve and frequently the third molars are a little outside the line of the ellipse. \* \* \* \* \* The incisors are arranged with their cutting edges forming a continuous curved line from cuspid to cuspid and this line is continued over the cusps of the cuspid and buccal cusps of the bicuspid and molars to the distal surfaces of the third molars. \* \* \* \* \* The lower teeth are arranged similarly, but on a slightly smaller curve, so that the line of the ellipse, which falls on the buccal cusps of the upper bicuspid and molars, will fall upon the buccal surfaces near the gum of the lower teeth.

(Tomes) "The teeth of the upper jaw are arranged along a curve of larger dimensions than those of the lower."

(Kingsley) "The normal type of dental arch I conceive to be a regular line. The arch may be wider or narrower, varying somewhat in individuals or races, but the line will be an easy graceful curve without a break or tendency to form an angle."

It seems to be quite generally conceded that the six anterior teeth describe the

arc of a circle and that the general form of the normal arch is parabolic in character. If we accept this our next concern would be to arrive at some definite idea of the size of the circle from which the arc is taken and the relationship which the arc bears to the width of the arch, its length, etc.

Of the more recent investigators of this subject, the work of Percy Norman Williams is of great interest and importance. In speaking upon the subject of determining the normal arch and relative proportions of such an arch he says:

"In an attempt to determine upon what parts of the arch I should make measurements, it occurred to me that it would be necessary to locate the center of the circle described by the front teeth. I took a photograph of a normal arch, located the median line and moved the compass back and forth on this line until the other point would fall on the six anterior teeth and invariably the center occupied a point midway between the molars. Acting for the time being on the assumption that the center of the entire arch might be at this point, I decided to take one measurement between the first molars, which I shall call *A* (Fig. 14). I also saw that the size of the circle in front was dependent upon the distance between the canines, that is, if the front teeth occupied the arc of a small circle, the cuspids would be nearer together than they would if the teeth were arranged in the arc of a large circle. I decided the distance between the points of the cuspids should be my next measurement, which I shall call *B*. These two measurements would indicate the width of the arch. The only measurement now necessary was to determine the length or depth from front to back along the median line. It is obvious that in a live subject, or on a model, it would be impossible to locate a fixed point at the back of the mouth, so this was overcome by measuring from the buccal groove of the first molar to the median line. This measurement I shall call *B*. This line *B*, being the hypotenuse of a right angle triangle, answers every purpose for determining the depth of the arch, as once this line is known the length of the median line is easily determined.

"The first set of measurements was taken from arches of five subjects, in all of whom the teeth were in normal occlusion. I might mention the fact that at the beginning of this work it was my intention to measure jaws in normal occlusions, excluding all others. I soon saw, however, that I was excluding some valuable material which might prove to be more interesting than cases of normal occlusions, all of which were natural arches, never having undergone orthodontic treatment. I was quite startled to find that the ratio of these three lines which I have already mentioned was practically uniform throughout five cases. They were as follows:

A	B	C
56	40	36
60	42	38
59	41	37
56	40	35
54	38	34

"Taking the average of these measurements and reducing them to the lowest ratio without fractions, we have

A	B	C
$\frac{14}{14}$	$\frac{10}{10}$	$\frac{9}{9}$

(See Fig. 14)

"As all of these first cases were beautiful examples of occlusion, I concluded there must be something significant in these strikingly similar measurements, and at once determined to see if Nature were playing a trick or if this were her method of constructing natural dentures. I thought at the time that living subjects were necessary, so I secured access to some manufacturing establishments and began to systematically measure arches of employees. My first group consisting of 50 individuals is shown here with the average ratio (Fig. 15). I selected only those which were free from marked irregularity. Little attention was paid to any arches that were out of alignment or showed arrested development. I soon learned that the percentage of arches suitable for measuring would be very low, so I began to look elsewhere. I visited the Museum of Natural History in New York City, and made measurements of skulls of about 50 of the native North American Indians, many of which were over five hundred years old. While many teeth were missing in most of the skulls, fortunately I found quite a number with the molars and cuspids present. Because of the loss of incisors

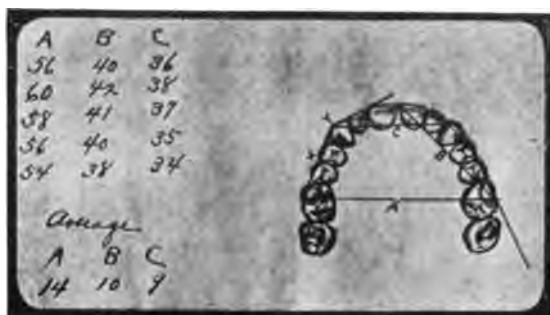


Fig. 14.



Fig. 15.

I am able to show only measurements A and C. You will be interested to know that while making these measurements at the Museum, I was very fortunate in meeting Clark Wissler, Director of the Department of Anthropology. I laid what material I had before him and expressed the opinion that there was not the variability of shapes in the arches that was generally believed. I wish to quote his exact words as he replied for I was so impressed that I wrote them down at the time. "There is no anatomical part in animals so uniform as dentition. Even between primitives and man there is a striking likeness in the shape of the jaw. Teeth make the arch, the species variability is so small in the ratio type that it requires careful measuring to detect the difference in shape."

Another investigator whose observations coincide with the findings of Williams, says:

"In an article published in the *Dental Cosmos* for November, 1917, I derived the relationship which exists between the dimensions of teeth and the di-

mensions of the arch. From the data, for which I am greatly indebted to Dr. Percy N. Williams, of New York, I showed that in the upper arch there are five points which lie on the circumference of a circle, the center of which is midway between the two first molars on a line joining their buccal grooves. These five points are the buccal grooves of the two first molars, the tips of the two canines and the point between the central incisors on the median line. This relation is so rigid in a normally developed arch that the values which I calculated corresponded within one or two millimeters with Williams' measurements. Fifty-four arches were taken at random, and in about 30 per cent, the calculated and measured values differed by only a fraction of a millimeter. In about 40 per cent the variations were two millimeters or less and in the remaining 30 per cent, the differences in the majority of cases were not higher than four millimeters in the width of the arch. These figures are very significant for even these small differences are reduced when the errors in measurements are accounted for."

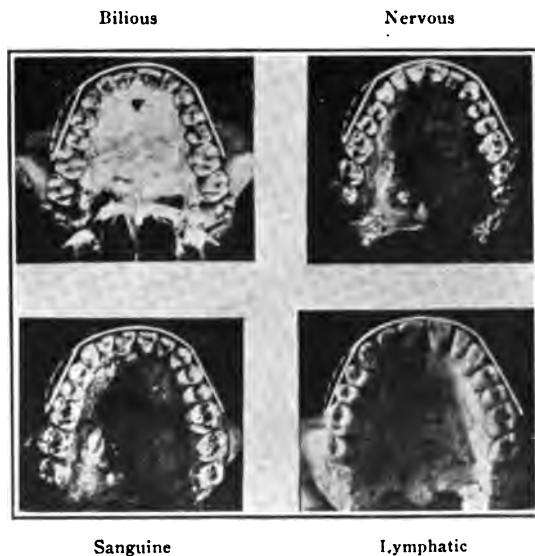


Fig. 16.—Typical arch outlines for the four basal temperaments. (From Turner's Prosthetic Dentistry.)

The same author further states: "If we consider that the ratio and temperamental differences find their expression in the form and the relative sizes in the teeth, we can readily understand how the outline of the arch is influenced by such differences. The position of the canine determines whether an arch is considered relatively wide or narrow and the location of the cuspid is dependent upon the relative mesio-distal dimensions of the crowns of the anterior and posterior teeth. If the anterior teeth are too large in comparison with the posteriors, the cuspids are pushed farther away from the median line along the anterior curve, and the arch will appear to be wide. If, on the other hand, the anteriors are too narrow the arch will have a narrow appearance.

"I also admit that a certain degree of curvature may seem to be present in the bicuspid region and this can be more clearly seen on photographic plates. Here I wish to emphasize that the buccal cusps and not the buccal surfaces of the posterior teeth are placed along a straight line. A line touching the buccal sur-



faces of the posterior teeth is a graceful curve which may be pronounced especially in the bicuspid region. The fact that in a normal arch the six anterior teeth lie along the circumference of a circle whose diameter is the distance between the buccal grooves of the first molars and that the buccal cusps of the anterior teeth are on a straight line will be true for all arches regardless of type.

"All this is clearly shown in the illustration (Fig. 16) which represents typical arch outlines for the so-called four basal temperaments. It may be noted that the arches of the bilious and nervous temperaments are unsymmetrical, that the left side is approximately normal in each case. The sanguine and lymphatic arches are very nearly normal. The diagrammatic outlines are drawn slightly larger than the proper size, for the sake of clearness. The writer selected these illustrations from a standard textbook. They were not originally intended to demonstrate these points, and it is hoped that the reader will be the more forcibly impressed with the facts."

These two investigators seem to be agreed upon the question of what constitutes normal arch form and the fact that they have based their conclusions upon the results of systematically acquired information makes them worthy of serious consideration. It is also of interest to note that in its main features such an arch will comply with the requirements laid down by the Anthropologist who says that, "under ordinary conditions of the skull and jaws, a normal dental arch is the arch of the normal set of teeth. Unless otherwise interfered with, the arch is what the teeth have made of it." It is quite easy to understand how arches entirely fulfilling the requirements laid down by Williams and Sved might differ somewhat in appearance, for no two arches could be exactly alike unless the teeth were exactly alike.

This is an important point to consider for usually when any definite plan of arch form is discussed, the average dentist immediately has a mental vision of a stereotyped form of arch without any latitude for variability. This, however, would not be true of arches designed according to the before-mentioned requirements, for if the anterior teeth occur large in proportion to the posteriors, the cuspids would be arranged farther away from the median line along the anterior curve and the arch would have a broad appearance, while if these teeth are narrow in comparison with the posterior the arch would have a narrower appearance.

As stated before, the six anterior teeth lie on the arc of a circle, the center of which lies midway between the buccal grooves of the first permanent molars. As a matter of fact this arc does not include the entire tooth substance of the six anteriors, but extends from the point of the cuspids on one side to the point of the cuspid on the other side. The mesial side of the cuspid takes the curve of the anterior teeth, while the distal portion of the cuspid takes the line of the bicuspid. In relation to the cusps of the bicuspids, this line would be a straight line which would extend from the point of the cuspids to the crest of the mesio-buccal cusp of the first molar, where the line again bends to pass in a straight line over the disto-buccal cusp of the first molar and buccal cusps of the second molar. While it might appear that the arch line from the anterior curve forms two sharp angles, one at the cuspid and another at the buccal cusps of the first molar, this is not really the case, for when the curvature of the buccal surface

of the cuspid and the bell or contour of the cusps of the bicuspid and molars are taken into consideration it will be seen that a gentle curve is described.

It is interesting to note that Gysi in considering the problems of articulation has described arch outlines which conform very closely to those described by Williams and Sved (Fig. 17). While he does not state definitely what the width should be between the molars in relation to the arc of the anterior curve, he does make the following statements: "The arches have the form of a parabolic curve. The incisors and canines of both arches form part of the arc of a circle. \* \* \* \* \*

"The distal cutting edges of the canines of both upper and lower arches should point in the direction of the molars, the necks of these teeth only being prominent, allowing the bicuspid to be placed so that they are only slightly visible from the front.

"Two straight lines touching the buccal surfaces of the bicuspid should

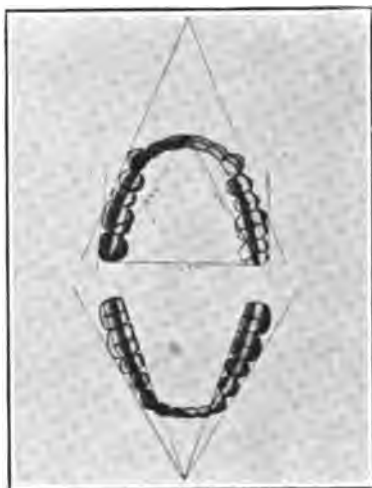


Fig. 17.

touch the mesial corner of the first molars and the distal half of the canines. The intersecting point of these lines should be at the same distance from the incisors as the incisors are from a line drawn across the base of the arch." (Gysi—the Problem of Articulation—Chapter 6, Cosmos, lii, No. 3.)

These arches differ rather conspicuously from the ideal arch described by Bonwill, in that the anterior teeth lie upon a smaller circle and there is less width between the molars. It will be recalled that six anterior teeth in such an arch lie on the arc of a circle, the radius of which is determined by the combined widths of the central, lateral and cuspid. The arch line after leaving the circle formed by the anterior teeth passes over the buccal cusps of the bicuspid and molars. These teeth, therefore, would be in a straight line which is extended backward from the cuspid in accordance with a geometric plan. The geometric plan upon which the Bonwill arch is established is shown in Figs. 18 and 19. This principle which was originally intended as a guide in setting up artificial teeth has been adapted to orthodontia by C. A. Hawley.

Some very interesting work along the line of arch predetermination has been done by W. H. Gilpatric whose idea of the normal arch differs somewhat from any of those thus far presented. Upon comparing his conception of it with those I have already described it will be found to be a compromise in width between the arches designed by Williams and Sved and the Bonwill arch. Like the other arches the anterior teeth lie upon the arc of a circle and the arches are parabolic in form. The diagrammatic outline of such an arch is shown in Fig. 20. It is interesting to note the process by which Gilpatric arrived at his conclusion. Like Williams and Sved he was convinced that the form of the arch

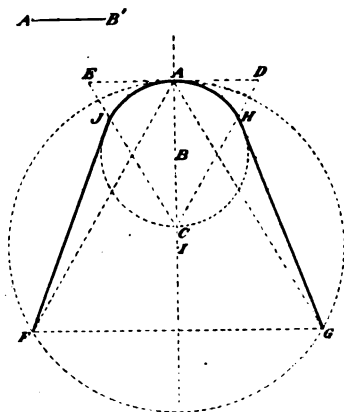


Fig. 18.—Hawley's adaptation to orthodontia of the Bonwill principle.



Fig. 19.—An ideal arch constructed according to the Hawley plan.

must depend upon the amount of the tooth substance within it. With this idea in mind, he selected trubyte teeth whose tooth substance was equivalent to that found in natural arches of various sizes. These he set up in an anatomic articulator and arranged them according to his conception of what constitutes arch form. He then subjected these teeth to all the various movements of occlusion and modified the shape of the arches until all such movements were possible. After the work on each arch containing a definite amount of tooth substance was completed, he submitted the result to Dr. Beckford, Professor of Prosthetic Dentistry at the Harvard Dental School, who approved of his findings. Notwithstanding the fact that his conception of the arch does not coincide with that

of Williams and Sved, Gysi, Bonwill or Hawley, the work he has done has been so thoroughly done that it is deserving of commendation and serious consideration. He has analyzed arches which vary in tooth substance from 78 mm. to 101 mm. (for the upper arch measuring from buccal groove to buccal groove of the first molars, and the corresponding tooth substance for the lower arches which he found varied from 8 to 12 mm. with the uppers). From these surveys he has produced a set of charts showing the survey of all of these arches. An interesting article outlining some of his work along this line was recently published in this JOURNAL.

A civil engineer interested in some of the problems of orthodontia once made the statement that orthodontia must outgrow the use of indeterminate appliances, and borrow from engineering the practice of laying out on paper what is proposed to be done before trying to do it. He supplemented this remark by saying that until such a plan was adopted orthodontic treatment would continue to be purely experimental—an art based on experience.

Whenever any attempt has been made to bring analytical mechanics and mathematics into orthodontic treatment, the objection has often been raised that these exact sciences are contraindicated, as they do not aid in the interpretation of biologic phenomena.

Such an objection, however, should hardly be taken too literally, for notwithstanding the fact that there are biologic factors involved in the movement of teeth which are not governed by mathematics or mechanics, we nevertheless realize that mechanical forces applied scientifically and correctly (which is possible in the hands of one who understands them) will not act conversely to biologic laws, and indeed, if so applied, will make more easy the solution of these problems.

Whenever orthodontic treatment is contemplated for a given case, the operator usually gives careful thought to the character of the appliances which are to move the teeth, and usually has in mind a more or less accurate idea of the extent of tooth movement required. As it is his wish to place every tooth in its correct relationship with the line of occlusion, would it not be logical to determine before tooth movement is begun what the line of occlusion should be? Certainly if every operator would do this, cases could be handled more intelligently and the various teeth moved into whatever positions were necessary, with a minimum loss of time or false movements.

If such a plan were universally followed, it would unquestionably have a tendency to shorten the active period of treatment, which would mean much to the comfort and welfare of our patients, because work carefully planned and systematically carried out would of necessity require less time than work accomplished under any other plan.

#### THE HAWLEY METHOD OF ARCH PREDETERMINATION

Unquestionably, Hawley appreciated these points and realized their necessity, and to him is due the credit of making the first attempt at predetermining arch form. As almost everyone is familiar with this method it will not be described in detail at this time.

The Hawley method has been the subject of considerable criticism, not only from dental engineers, but orthodontists as well, who have objected to it on various grounds. Notwithstanding this criticism, I feel that great credit is due Hawley for the spirit in which he introduced this method, and I venture the opinion that had it been universally adopted at the time it was introduced, more satisfactory results would have been accomplished by orthodontists generally than have resulted by every operator creating arch form in accordance with his own ideas of what it should be. Hawley did not make extravagant claims for this method, but merely suggested it as a guide in diagnosis and treatment.

#### THE STANTON METHOD OF ARCH PREDETERMINATION

The question of arch predetermination has received a decided stimulus from the efforts of F. L. Stanton, whose researches in this subject have extended over a number of years. In his earlier efforts, he attempted to apply engineering

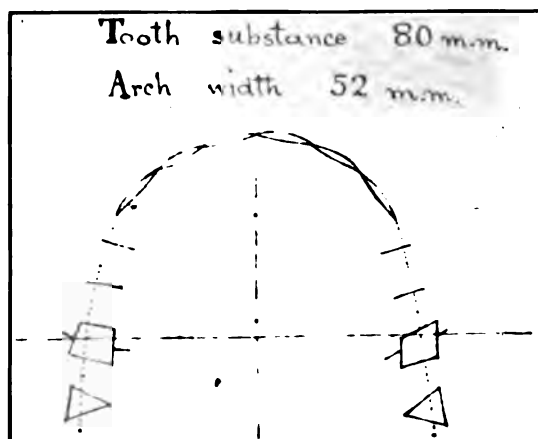


Fig. 20.—The outline of a normal arch of given tooth substance, according to Gilpatrick's plan.

principles to orthodontia, but was not satisfied with the results, owing to the fact that such a method required so much labor on the part of an engineer that it was impractical. He therefore discarded this method, and in cooperation with a civil engineer, devised a new method which was mechanical and made possible through an instrument for arch determination which they have called the occlusograph. According to my conception of it, Stanton's method is founded upon the assumption that the form of the arch varies according to the amount of tooth substance contained within it. He, therefore, measures from perfect plaster models the greatest mesio-distal diameters of the teeth, and then relies upon his occlusograph to determine the arch outline in the following way. This instrument is supplied with a series of links corresponding to the number of teeth present in a perfect arch, these links varying in length to correspond with the various mesio-distal diameters of the teeth they represent. These are placed in series when a given arch is to be analyzed, the links used corresponding exactly in size with the teeth they represent. Thus two series of links are arranged, one for the upper teeth, and one for the lower, and the two series fixed to each other

in such a relation that the teeth will be in perfect occlusion. In order to accomplish this, the distance from the buccal cusps to the center of the fossa on the occlusal surface of the teeth is measured in the molar and bicuspid region so that the correct overbite can be selected. The upper and lower series of links are clamped into position, as shown in Fig. 21, the two crossbars being used to obtain symmetry of the arches.

The idea involved in attaching together the two sets of links representing the upper and lower teeth is to determine the form of the arches, as the two are modified until a correct occlusal relationship is established between them.

Not only does Stanton believe that the form of the arch varies according to the amount of the tooth substance within it, but he says in speaking of the form of the arch that "the whole arch depends on the interrelation of the sizes of all of the teeth, all dimensions of the teeth, and all parts and forms of them. If you should have in two cases, the same teeth, the only exceptions being in the two

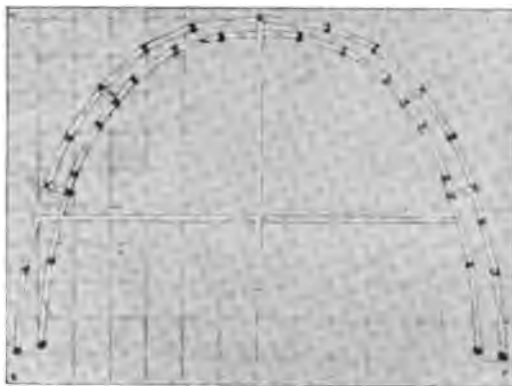


Fig. 21.—The occlusograph.

incisors, and they should vary only two millimeters, the entire arch would vary. The smallest change in any tooth produces a material change in the form."

Manifestly, it would be unjust to the method and to its author to comment upon it favorably or unfavorably without being in possession of all of the facts concerning it therefore, I must refer those interested to the various articles already published regarding it, so that they may draw their own conclusions.

#### THE WILLIAMS METHOD OF ARCH PREDETERMINATION

This method is based on the hypothesis that in the normal arch there are five points which lie upon the circumference of a circle, the center of which is midway between the two first molars on a line joining their buccal grooves. These five points are the buccal grooves of the first molars, the tips of the canines, and the point between the central incisors on the median line. Since three points on the anterior curve fall upon the circumference of a circle, the curve of the anterior teeth is considered to be an arc of a circle.

Following out this hypothesis, Williams' associate, Sved, has worked out a mathematical formula, by the use of which the dimensions of the arches can

be calculated from the measured mesio-distal diameters of the teeth. As I have already dwelt at some length upon the findings of Williams and Sved, they will not be considered further at this time.

#### THE GILPATRIC METHOD OF ARCH PREDETERMINATION

Like the methods already described, the Gilpatric method is founded upon the assumption that the form of the arch varies according to the amount of tooth substance contained within it.

After analyzing arches which varied in tooth substance from 78 mm. to 101 mm. for the upper arch, measuring from the buccal groove of one first molar to the buccal groove of the other first molar, and the corresponding tooth substance for the lower arch, which he found varied with the upper from 8 mm. to 12 mm., he has from his analyses produced a set of charts showing the dimensions of the arches varying between the extremes mentioned.



Fig. 22.—Illustrating the effect of correct and incorrect proportioning of the dental arches. (After Percy Norman Williams.)

As stated previously, in order to arrive at a definite idea of the arches of a given tooth substance, Gilpatric duplicated the natural teeth with trubyte artificial teeth, which he placed upon an anatomic articulator, subjecting them to all the various movements of occlusion, modifying the shape of the arch until all such movements were possible.

When this point had been reached, each arch was surveyed so that the arch form could be recorded, and from these records a set of charts has been produced which Gilpatric has called *orthodontographic charts*.

Fears have often been expressed and objections raised to injecting into dentistry any mathematical or mechanical method for predetermining the shape and size of the dental arches. One of the chief objections offered is that such a plan, if adopted, would eliminate the exercise of artistic judgment in our work. If the dental profession were filled with artists, this objection might be considered logical, but as stated before, an examination of the mouths of the majority who wear full upper and lower dentures and of those who have had their mouths subjected to the vagaries of hit or miss orthodontia, bears eloquent testimony

to the fact that almost any plan founded upon normal anatomic principles as well as on recognized principles in art would be far more safe for the profession to follow.

It is safe to say the majority of patients who have undergone orthodontic treatment have not received the maximum benefit possible, owing to the fact that the operators have tried to establish arch form in accordance with their own set ideas of what the patient needed. A close analysis of the majority of cases of malocclusion shows the need of expansion in the lateral half of the arches. (Fig. 22.) Instead of carrying this expansion to the needed degree, the average operator will push the anterior teeth forward and create a long narrow arch, which is, in the majority of cases, both incorrect anatomically and artistically. The laity have commenced to realize this, and orthodontists are often being asked by solicitous parents who are considering orthodontic treatment for their children, "Doctor, will this make my child look too mouthy?" This shows that parents have noticed the mutilating effect of arches created without any definite idea of what constitutes normal arch form and which in reality are created only with the idea of getting all the teeth in the mouth arranged in a concentric line.

I am convinced that if those who are interested in establishing normal arch form would adopt as a guide in their work any plan of arch determination which is based upon the amount of tooth substance contained within a given arch, and upon recognized anatomic principles, will render a far greater service to his patients than is possible to him who depends upon his "Eagle Eye" to guide him on his way.



# DEPARTMENT OF ORAL SURGERY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

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## PERVERTED "FUNCTIONAL" ACTIVITY IN THE PRODUCTION OF JAW DEFORMITIES\*

BY D. M. SHAW.

*Curator of the Prosthetic Laboratories, Royal Dental Hospital of London.*

THE "perverted" or nonnormal activities which it is desired here to draw attention to are "functional" only in so far as they are excited and exhibited in the oral preparation of alimentary substances. The "jaw deformities" that it is hoped to throw some additional light upon are those occurring among children, and chiefly recognized and estimated (in occlusion) as irregularities or abnormalities in the position of teeth, the teeth themselves emerging structurally sound and normal in shape. The various dental units are constructed faultlessly and are ready (we may assume) *to time*. They are then potentially available for building into a machine which is highly efficient as a food-preparing mechanism when the units are normally arranged, which then also, when normally exercised, is adapted to maintain the health and integrity of its various parts and investing tissues. But in the abnormalities frequently seen the functional efficiency is greatly depreciated; the specific shapes that in man have for ages remained morphologically constant are there present, but the teeth are thrown together in such disorder as to more or less abort their utility, and the normal *rhythmical* activity in mastication becomes impossible. It will be agreed, and without touching at all upon the many other consequences involved, that this is a somewhat poor beginning for that part of the alimentary processes over which we could safely exercise the most direct and most knowledgeable control.

### THE "SOFT FOOD" THEORY

Any references to current theories of causation will here be closely restricted to what may seem helpful in bringing my proposition into reasonably clear view. Absence or insufficiency of the harder foodstuffs has long been held to be a dominant cause of malocclusion. The "soft food" theory and the indicated remedy have been insistently kept in the forefront by several accepted authorities, and in

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the general lay and professional mind there is, at any rate, a pious if not a very active belief in the soundness of that view. While no one seeks to deny that by lack of functional exercise the jaws *may* fail to attain their full development, there are yet many groups of malocclusion cases (involving protrusions, retrusions, contracted arches, spread arches, and excessive anterior overlap) wherein this explanation has been rejected by the majority of those interested in the subject. The limb muscles of different children undergo widely differing amounts of exercise; in many individuals the exercise may be deficient in amount, but no concomitant bone deformity ensues.

Professor A. Keith, whose suggestion that the "sensitizing" action of the pituitary secretion may be at fault was so finely lit up by the searching beam he cast into the less-explored field of comparative odontology, is at the same time in entire agreement that one should also give exhaustive attention to those "grosser" agencies which are known to alter and regulate growth—"the mechanical impulses which arise from the natural use of parts."

Quite a number of alternative explanations have been offered with varying degrees of confidence and support, the difficulty and low solubility of the problem being illustrated by the emergence, for example, of theories of causation, some of which are diametrically opposed—viz., the theory held by Dr. Sim Wallace and Sir Arbuthnot Lane that contracted or narrow jaws are caused by a feeble musculature of the tongue resulting mostly from the use of *soft* food, and the explanation advanced by Professor H. P. Pickerill that narrow jaws are due to the use of food that is too *hard* or *tough*. Again, in regard to defects or wrong use of the respiratory parts as a factor in jaw deformities, although the vitiating physical or mechanical conditions that exist during *free mouth* breathing are distinctly different to the conditions during *obstructed nasal* breathing, and therefore the effects directly due to the former must differ markedly from those due to the latter cause, yet in articles and discussions those important differences are usually either glossed over or ignored.

#### THE EXISTENCE OF POSITIVE FACTORS

Whether or no in modern times a harmful change has taken place in the kind of food given to children, the number of meals per day has probably not lessened and the total time given to eating may be taken as not less now than was customary among children in the near or more distant past. Therefore, as the mouth is in *some* kind of activity during that time, inquiry into the effects or defects arising should not be confined to consideration of the merely passive or negative factors. The absence of positive factors can not be assumed, and they should be searched for and their value as far as possible ascertained by close and persistent observation of the *machine at work* in large numbers of children. For some years past I have missed no opportunity (and have artfully created a good many) of observing the different ways in which the mouths of children deal with food.

A direct view of what is going on in the mouth is, of course, very much cut off and masked by the cheeks and lips, but this drawback is in some degree compensated for by the fact that watchful observation of those same moving curtains

will often betray what is happening behind the scenes. Correct interpretation of the mouth and jaw movements which take place and of the probable results of the various efforts in manipulating food will, it is reasonable to believe, be favored a good deal by previous close study of the chewing mechanism in children and adults, and not only in normal but also in abnormal, crippled, and mutilated dentitions. The small amount of interest up to the present taken in the physiological morphology does not warrant, however, the entering into details, "tedious" details that are in reality essential in this as in any other mechanism. The following is a rough summary of the results of observation of many groups of children.

1. There is in many cases an excessive amount of manipulation of food by *the tongue*. The tongue movements vary from very languid to very energetic, sweetened foods usually exciting the tongue to the greater activity, especially in upward pressure.

2. The normal work of fine reduction by *the cheek teeth* is only partially carried out and is often not performed at all. Morsels are merely rolled about in the mouth, with an occasional squeeze from the tongue or teeth, and what are in reality remarkable feats of food bolting pass quite unnoticed. The performances of some of these juvenile, yet often well-mannered, "bolters" are so mysterious and *finished* that it is almost impossible to understand how it is done.

3. Certain foodstuffs which constitute a large proportion of the daily intake (including cereals and breadstuffs permeable and softened by saliva, sweetened puddings, etc., porridge, sweets, jam and confectionery) are manipulated and "mashed" by the tongue *against the anterior surface of the palate*, partly to break up their consistency and partly to develop and extend the gustatory enjoyment. Sucking actions are often involved, and among the several *reflex* actions excited by very sweet substances is a frequent strong pressure of the anterior dorsal surface of the tongue against the front of the palate. In these various movements the muscular pressure exerted by the tongue is *many times greater* than that required either for the successive liftings of portions of food into position between the cheek teeth or for moving food from one part of the mouth to the other. Here we have a kind of "tongue mastication" (*vide* Mr. J. G. Turner) which, while admittedly falling within the limits of normal function when performed occasionally, becomes *abnormal* or perverted when exercised frequently and to the extent of in large part supplanting normal mastication by the cheek teeth.

4. In some children—more usually of the "vigorous mouth and hearty eater" type—the reduction of *tough* morsels is to an abnormal extent effected by *the anterior teeth* instead of by the cheek teeth, which latter teeth may either be absent or crippled by caries, or, if present, they are thrown out of effective shearing alignment by a malocclusion already established. In this type the cutting edges of the anterior teeth are found to be more worn—and to an undue or abnormal extent—than those of the posterior teeth. Later on one may often observe premolars and molars that have been fully erupted for several years and yet show not a trace of intermaxillary attrition or of food abrasion. Now, when for any reason fine (or moderately fine) reduction of tough food is attempted by the incisors alone, the tongue has to exert considerable upward and *forward* pres-

sure in order to *hold the small morsels in proper position* for each successive shearing stroke. This work of reduction (which by the arithmetical increase of the divided fragments must constitute by far the greater part of the total masticating effort) is effected normally by the multi-bladed cheek teeth, in which the rows of lingual cusps automatically, as it were, hold and support the fragments in position, and without calling for more than the very lightest use or pressure of the tongue.\*

#### SOME PREDOMINANT FEATURES IN MALOCCLUSION

The bearing of the above-mentioned perverted activities of the tongue upon jaw deformities may here be best brought out by a short consideration of certain features that are often found associated in various classes of malocclusion.

Twenty years ago (1899) the adjourned discussion of a paper on "The Treatment of Superior Protrusion," read by Mr. J. F. Colyer at the Odontological Society of Great Britain, included a full and interesting contribution from Mr. E. Lloyd-Williams on the etiology of that deformity. In the discussion following—deservedly a "classic" upon the particular subject—all the known explanations were in turn advanced, excepting perhaps only the ductless gland theory and the antenatal and parturition theories. Yet as one of the speakers very moderately expressed it, "there was still something missing in all the hints which had been thrown out with regard to causation."

There was general agreement upon the points mentioned by Mr. W. Hern and Mr. Lloyd-Williams as to the following three or four abnormalities found associated in the majority of superior protrusion cases: (1) The high level attained by the alveolar anterior border of the mandible: (2) shortening of the body of the mandible; (3) the increased depth or low level of the premolar and molar region in both maxilla and mandible; (4) some narrowing of the arches; (5) a backward "bite" of all, or nearly all, the mandibular teeth.

#### SIGNIFICANCE OF THE ABNORMAL VERTICAL OVERLAP

The high level or uprising of the incisive border of the mandible involves, *ipso facto* (excepting only in cases of "open bite") an abnormal degree of vertical overlap in the occlusal relationship of the incisors, the opposed incisors quite often overlapping one another to the full length of their crowns—that is, from two to three times more than the normal amount. Now it is a remarkable and perhaps hardly recognized fact that if and when—from whatever cause—this excessive overlap is in any particular case once established, the several other abnormalities set out above must then of mechanical necessity be concomitant, if not actually consequent, features. This statement requires qualifying in regard to the fourth abnormal feature, inasmuch as the arch in some cases does not undergo a *general* narrowing. But excessive overlap must in most cases involve a narrowing of, at any rate, the anterior portion of the mandibular arch, because the lower anterior teeth are shifted to a smaller "circle" (shorter tract) within or behind the lingual walls of the upper ones; the only two alternatives

\*"Mechanism of Mastication in Man," Trans. Sixth Internat. Dental Congress, p. 63 et seq.  
"Form and Function of Teeth," Jour. Anat. iii, October, 1917.

possible being a broadening (anteriorly) of the upper arch, or an excessive retrusion of the lower one. Excessive overlap is a feature of many cases other than those of superior protrusion, and the search for its origin—as probably the master-key to the casual explanation of many jaw deformities—has always made a fascinating appeal to the writer.

PERVERTED ACTIVITY OF THE TONGUE PRODUCES DEFORMING STRAINS IN THE  
TOOTH-BEARING TISSUES

The tongue is drawn forward and pressed against the lingual walls of the upper anterior teeth and anterior surface of the palate chiefly or almost entirely by the contraction of the geniohyoglossal muscle. Although theoretical consideration of the normal anatomy and physiology of the parts might bar out any dispute upon that point, it may be well to mention in addition the following demonstrable evidence: 1. Subjective experiments by the writer and some others in whom the lower premolars were missing. By inserting a hooked finger at the angle of the mouth the strong contraction of the genioglossal muscle could be distinctly felt whenever the tongue was thrust upward and forward as described. 2. Experiments upon two subjects in whom the symphyseal portion of the mandible had been removed, and as a consequence the tongue (sound and about normal in size) could not be protruded beyond the lips, and even when the tongue was kept inside the mouth no *forward* pressure could be exerted with it.

It is clear, then, that by the contraction of the genioglossal muscles the lower jaw is subjected to a backward pull at and about the region of the genial tubercles, which backward traction is abnormal just in proportion as the forward thrust of the tongue is abnormal in force and frequency of action. This backward pull is in daily operation during the four or five years' reign of the deciduous dentition, and, in addition, throughout the period of change to the permanent dentition. During most of that time the horizontal U-shaped cortical tube of a child's mandible is a frail box almost "cram full" of teeth. Moreover, the strut-and-stay system of trabeculae, the tooth crypts, and to some extent even the cortical bone of the main beam, are undergoing a constant process of breaking down and reconstruction; the alveoli, too, are in turn "swept away"—as Sir C. S. Tomes describes it—and rebuilt. Even in the completed jawbone of the adult the long-continued action of abnormal stresses brings about bending and shearing strains that in time appear as obvious deformities; the striking deformity observed (in the horizontal branch of the mandible) in some cases of ankylosis has been attributed by Dr. M. H. Cryer to the abnormal action of the *depressor* muscles, the power of which is, nevertheless, thought to be fractionally small compared with that of the elevator muscles. The more readily, then, will one admit that during the growing and reconstruction period the reaction of the mandible to abnormal stresses may take effect both in inhibiting and disorganizing growth and producing durable strains (deforming changes of shape) whenever the stresses exceed certain limits of force and time (or frequency) of action. These limits are known to be low for young children; in the routine practice of orthodontics they are purposely overpassed by the artificial application of very small forces.

I have estimated quantitatively the force of the tongue's upward and for-

ward thrust, and although my measuring apparatus is too crude and imperfect to warrant presenting figures, I am quite satisfied that this force is many times greater in amount than that effectively used by dentists to move teeth and alveoli—often, too, in the permanent dentition.

Those who regard with some doubt the various explanations that the mandibular retrusion is due to “want of development,” “heredity,” “small tongue,” and other suggested factors that are ill-defined and mostly negative, will be glad to turn to the consideration of a positive factor that can be *seen in action*, that acts in the precise direction required to produce the observed phenomena, and the more hidden results of which in changing the normal disposition of the bony tissues can be further investigated by x-ray examination and also in the dissecting room. In some cases it may be that the backward or centripetal pull of the genioglossal and “sublingual” muscles produces retrusion of the mandible solely or mainly by *inhibiting or restraining its development*. But to deny or exclude the possibility of actual deforming *strains* (that is, slow yielding of the bony tissues) occurring, would be to make a unique exception of a particular part of the jaw, and to endow it with an unknown superresistant quality. And if growth-inhibition or yielding from backward traction *did* in point of fact occur, the resulting deformities would be exactly like those that confront us daily and with increasing frequency, and that, in this country alone, must affect many thousands of children in whom the handicapping disorder will not be treated or ever right itself.

I turn now to the *excessive overlap* or (what is practically the same thing) abnormally high level of the incisive border of the mandible. The majority of observers are agreed that the causes of this very common deformity, by no means confined to superior protrusion cases, “remain shrouded in sphinx-like mystery.” Explanations such as “pressure of the lower lip,” “eruptive pressure of the canines” have been somewhat waveringly offered, and in application to but a few cases only the explanation I here advance applies to a wide range of cases, possibly to nearly all cases of excessive overlap.

It can be shown that the part of the tongue whereat (during eating, sucking, etc.) pressure is applied against the palate and anterior upper teeth lies at a *higher level* than the bony area of attachment of the genioglossal muscle. Therefore in the resistant pull of this muscle upon the tongue there must be a *downward* as well as a backward component, the general substance of the tongue being at the same time stiffened to a quasi-rigidity by a number of other muscles, the coordinated actions of which it is needless at present to attempt to analyse. When holding the raised tongue against the resistance offered on or at the anterior maxillary surfaces, the genioglossal fibres are perforce inclined markedly upward so that (reaction being equal and opposite) their contraction must exert an obliquely *upward* and backward pull upon their place of origin on the mandible. The existence and the strength of this upward pull can be felt and realized when (under the conditions described), with an inserted finger, an attempt is made to press or keep the converging anterior part of the muscle down. Under this upward tensional stress the young “*unready*” bone is *strained* and very slowly and gradually *yields in an upward direction*. The force of the

pull is distributed on and about just that very region where the apices of the milk anterior teeth and the crypts of the permanent ones lie, so that it would undoubtedly tend to produce the unexplained variety of phenomena found associated with uprising of the alveolar border—"apical crowding" and anterior "crowding" with or without spacing of the crowns, the "fan" arrangement, and the (hitherto) completely puzzling type mentioned by Sir Harry Baldwin, wherein the lower incisors "were jumbled together into two lines."

And the "low level" of the mandibular postcanine teeth is a further and almost inevitable consequence ensuing from the downward component of the tongue's pressure upon the diaphragmatic floor of the mouth, whereon the base of the muscle-stiffened tongue finds the necessary resistance to its own upward thrust. The digastric and geniohyoid muscles play a considerable part in supporting the upward thrusting tongue, but certainly the mylohyoid "slings" upon which the tongue is seated must exert a downward pull upon those inner surfaces of the mandible from which they are hung. Experimental trial (subjective and objective) readily shows that in reaction to the tongue's upward thrust the downward bulge of the oral floor is both seen and felt to be lowest or most prominent in the region of the lower premolars and first molars, where, as it happens, the "low level" of the alveolar border or teeth is found to be the most marked. It is worth noting, too, in view of the downward traction internally, that the mandibular cheek teeth often have an abnormally inward tilt.

The pull of the mylohyoid (under the tongue's perverted activity) will of course vary in strength and *direction* with the individual, and with the varying proportional development of the different tissues, including the tongue itself. So that when the tongue is (constitutionally?) small and narrow, the supporting mylohyoid sheet may attain a more nearly horizontal plane, and its pull will then be the more directly *inward*, tending to draw the two sides of the mandible together. Thus if a tongue small or subnormal in volume is found associated with a narrow arch, the usual explanation that the small tongue (negatively or by its passivity) causes the narrow arch may be wrong, and is based too much upon assumption. The significance, if any, of the association can be more instructively interpreted by taking into account the more horizontal direction of the contractile pull of the mylohyoid upon the mandible. A large tongue will, on the other hand, the more deeply bulge into and fill the oral floor-space, partly overcoming the resistance of the mylohyoid sheet and causing its pull upon the mandible to be more downward and less inward. In regard to the inward traction the following observation may be significant.

During the routine examination of many thousands of occluded plaster casts. I observed that in a proportion of those in which the occlusion of molars might be reckoned as good mesiodistally the occlusion buccolingually would have been better or more normal if the mandibular molars were moved buccally or wider apart—that is to say, the mandibular arch was a little too narrow at the first molars for the normal occlusion of these teeth with their maxillary opponents. This in itself suggests the possibility that in some cases the *lower jaw leads the way* in the contraction of both arches.

In conclusion, it is urged that what I have called (in short phrase) "per-

verted activity of the tongue" is harmfully frequent among children, and is incited chiefly in the oral manipulation of foods a *preponderant* amount of which is of a sweet, soft, or glutinous nature; and also less frequently by the crippling or (from whatever reason) insufficient use of the cheek teeth.

At the same time it is possible to go to the other extreme by encouraging young children to masticate well an unduly large proportion of tough food, so that the anterior teeth are to an undue extent called upon to relieve the overworked cheek teeth in the extra labor of fine reduction; the forward-thrusting and holding action of the tongue is thus brought into too frequent use, and the mandible is subjected to an upward and backward traction. In several reported cases (including children of dentists) where the precepts of vigorous mastication were faithfully and conscientiously put into practice, the deciduous arches were seen to be broad and fine, and the teeth individually were in every way satisfactory; nevertheless, the puzzling excessive overlap was there, as well as some degree of post-normal occlusion.

That the forward thrust of the tongue during its perverted activity must, in some cases, induce protrusion of the *upper* teeth is so evident a proposition that I omitted any explicit statement on the point, and detailed discussion is here barred out for want of space. But what I regard as remarkable and important in my discovery (about five years ago) of the tongue's abnormal activity, is its unsuspected yet inevitable reaction on the mandible. The tongue exerts a *centrifugal pressure on the maxilla* anteriorly, and the main resistance and reaction to the tongue's thrust takes effect as a *centripetal traction on the mandible*, the one being in effect the reciprocal of the other.

The great majority of superior protrusion cases are associated with inferior retrusion, as stated by Mr. Norman G. Bennett when reporting (March, 1912) to the British Society for the Study of Orthodontics, for the Committee on Orthodontic Classification. The degree of superior protrusion actually produced during functional activity must depend upon the greater or less amount of counteracting restraint and inward pressure from the upper lip, which effective centripetal pressure varies, I think, not so much or so entirely with the length, thickness, or "poise" of the lip as with the "temperamental" and muscular *motility* in the particular individual. This line of investigation may seem too obscure to bring out anything helpful, but in point of fact striking differences in the functional labial movements of different individuals are made evident merely by visual observation. More important, however, and more directly bearing upon my present thesis concerning the identification of primary causes and the actions they evoke, is the marked influence of *reflex* movement and pressure, here just touched upon as follows.

#### GUSTATORY REFLEXES

Among the oral *reflexes* incited by sweetened food and sweet substances, as well as substances with an acid or a "sharp" taste, there are certain labial and buccal muscular actions which very probably play a part in the contraction of the upper arch. Discussion of this would be quite relevant, but must be deferred.

I propose in a future communication to show that perverted activity of the tongue may also bear a causal relationship to two other deformities of the jaw—namely, (1) inferior protrusion or "underhung" bite; and (2) open bite.



# DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

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It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

## DESCRIPTION OF CASE AND OUTLINE OF TREATMENT

BY B. FRANK GRAY, D.D.S., SAN FRANCISCO, CAL.

**A**NOMALIES of dentition are of more than usual interest to the orthodontist. There ever recurs the question of etiology in such cases, and so far I think it has never received a satisfactory answer. Congenitally missing teeth afford ample opportunity for profitable discussion, and our skill is taxed quite sufficiently in the matter of successfully treating our patients who present such discrepancies.

Radiograms are shown of a girl thirteen years of age. Both of the mandibular second bicuspid are absent. The same is true as to the maxillary right second bicuspid and both the first and second left bicuspid. It will be noted in Fig. 3 that the maxillary right bicuspid is "impacted" to the lingual of the cuspid tooth. Note also the deciduous cuspid in its normal position.

In the absence of model illustrations, please bear in mind carefully the outstanding characteristics as to the occlusion, as follows: The first molars are in "end-to-end" occlusion. The mandibular incisors occlude with the maxillary incisors at the gingivæ, while the latter teeth are separated somewhat and protrude approximately a full quarter of an inch.

The radiograms show the second deciduous molar teeth possess very well-formed roots, and little or no absorption is in evidence. Ordinarily one might expect those teeth to remain in place and give service for a good number of years. It is believed, however, the better treatment of the case would be to remove these deciduous molars, and bring forward the first permanent molars. It is to be remembered the treatment of this patient calls for increased vertical development in the molar region. Those who have endeavored to bring about any considerable change in the positions of the deciduous molars under such circumstances will doubtless agree their period of usefulness would be materially shortened in any endeavor to bring them up (or down) to a new occlusal plane, such as would be established by the first permanent molars.



Fig. 1.



Fig. 2.

The maxillary right deciduous cuspid should be removed, and the permanent cuspid tooth brought forward somewhat, permitting the impacted first bicuspid tooth to erupt.

With both bicuspids absent in the upper left, a bridge will be necessary. Since the maxillary third molar is congenitally missing on the left side, it may be well to allow the first molar to retain its position, thus providing for its occlusion ultimately with the mandibular second and third molars. Of course this method will make necessary a bridge of two teeth. The other course might be followed; i. e., the moving forward of the maxillary first molar. Under that procedure but a single tooth would have to be bridged in, which doubtless is a valuable consider-



Fig. 3.

ation, but it would leave the mandibular second and third molars with but little function to perform.

It may be thought by some that to follow the course outlined entails much serious work, and so it does. But an essential of the treatment is to secure vertical development in the molar region. That very requirement is most apt to render the second deciduous molar teeth useless in a very short period of time, when the patient will awaken to the fact that four bridges instead of one are demanded.

Doctor Robert Dunn and myself are of the opinion the treatment as briefly outlined is the one indicated in this case. Doubtless some different opinions may be held by others. In any event the radiograms are presented, with the foregoing suggestions, believing that anything along this immediate line is timely.

# **ABSTRACT OF CURRENT LITERATURE**

**Covering Such Subjects as**

**ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY**

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

## **Operative Treatment of Fistulas of Steno's Duct. P. Sebileau. Bulletin et memories de la Societe de chirurgie de Paris, 1919, xlv, No. 26, p. 1220.**

Fistulas of Steno's duct following upon war traumatism are less common than fistulas of the parotid gland, but on the other hand more serious, for the latter usually heal at the end of a few months by Nature's unaided efforts, whereas this outcome is exceptional in the former. In the course of the war, the author observed about ten cases of Steno's duct fistulas, all of which with a single exception were operated upon and cured. In one case, the patient's cheek was found to contain a large wooden splinter, driven in by a bursting shell, small abscesses, followed for a few days by a scanty discharge of saliva, still formed from time to time, after the performance of two operations. There are three distinct groups of cases; in the first, the exposure of Steno's duct permits the discovery and approximation of its two extremities, in the second, it permits their discovery, but not their approximation, in the third it permits the discovery of the upper, but not of the lower extremity. The end with the fistula was never missed by the author, who devised a special procedure for each of these varieties, but always based upon the same idea. Drainage towards the mouth, along threads passing through the cheek, of the saliva dripping from the upper orifice of Steno's duct. All these operations have the first stage in common, namely, the treatment of this orifice. Two or three thin silk or linen threads are passed through the trimmed end of Steno's duct, each of these threads forms a loop around the cut end and terminates in two floating threads which must not be tied together. The second stage varies according to the anatomical conditions. All the ends of the threads having been grasped in a buttoned stylet, this instrument is buried in the buccal cavity as follows: In case the lower end is within reach, the stylet armed with all its threads is passed into it; these threads penetrate into the mouth through the anatomical orifice of the canal, after having circulated in the cavity of the duct. The two extremities of this canal are then brought together and sutured; the threads become invisible. When, on the other hand, the two extremities can not be approximated, the threads after having been inserted in the lower end, are left in midst of the cellular tissue of the cheek, and will remain visible in a portion of their course. When the lower extremity of Steno's duct is not demonstrable, the buccal mucosa is opened as close as possible to the

anatomical entrance of the canal, and the threads are passed through the established gap, in this case, they remain visible in the thickness of the cheek. No matter what has been done, the threads are collected in a slender bundle which is brought out of the buccal cavity through the corresponding labial commissure, and they are fixed on the skin with a small piece of adhesive plaster. At the end of a week, they are all withdrawn by means of simple traction on one of the extremities of each thread. As far as practicable, the fibrous scar-tissue produced by the cicatrization process of the traumatism is resected, and the two lips of the surgical wound are sutured without drainage. Usually, a slight swelling of the tissues occurs in the days following upon the operation; the surroundings are reddened, the cheek becomes hard, and a mild inflammatory reaction develops. A slight sero-purulent discharge was repeatedly observed by the author. At the end of two, three, or four weeks, normal conditions are restored, and the fistula has closed.

**Oral and Plastic Surgery in the Intermediate Section of France.** H. A. Potts. *Journal American Medical Association*, 1919, lxxiii, No. 16, p. 1184.

This interesting contribution being easily accessible in the original, the excerpt is limited to the part dealing with the removal of foreign bodies as practiced at Base Hospital No. 202. The method consists of a table beneath which is a movable roentgen-ray tube, the vertical ray of which is directed upward through the foreign body. The fluoroscope, also adjustable and at right angles to the vertical ray, is lowered on the part. The movement of the tube marks the excursion of the body on the fluoroscope. Blunt artery forceps are then placed on the skin at the supposed depth of the foreign body. The tube is again moved, and if the excursion of the tip of the forceps coincides with the excursion of the foreign body, it is exactly at that depth. The forceps are then held to mark the spot on the skin, the headlight of the operator is turned on, and a button hole incision is made in the skin. The forceps are introduced, and under the fluoroscope are carried by a boring motion to the foreign body, which is grasped by the forceps and extracted directly under the eye. From one to five minutes is consumed by the whole operation, and there is no mutilation of the tissues. More than four hundred foreign bodies were in this manner removed, with 100 per cent success.

At the earliest possible moments after injury, all foreign bodies, including detached bone fragments and tissues injured by the missiles, should be cleanly dissected out, as the lacerated soft tissues do not retain their vitality and subsequently become culture mediums for bacteria. Reduction of fractures, immobilization and retention of fragments, together with adequate drainage, established with the idea of its continuance much longer than in wounds of other parts of the body, were the aims of the maxillo-facial staffs within the intermediate section.

**The Use of Maxillary Prostheses.** F. Garcia del Villar. *La Odontologia*, 1919, xxviii, No. 7, p. 337.

In the surgery of the mouth, and more particularly in maxillary surgery, a most important part is played by the odontologist. A close collaboration between the operating surgeon and the odontologist must be maintained during the entire

course of treatment, especially because the only efficient curative procedure in these cases is the application of a prosthetic apparatus made for each individual case, necessarily requiring the intervention of a trained odontologist. The employment of bone-suture is rejected by the author in all cases, in spite of the fact that bone suture is recommended as a routine procedure by certain operators. His refusal is based on personal observation of numerous cases treated by this method, which regularly presented more or less considerable deformities of the bony framework of the face and consequently of the soft parts, leading to a change in the function of the mouth. Bone-suture involves further disadvantages of an equally serious character, such as infection of the focus, rarefaction of bone due to mobilization of the fragments, necessity of another operation for the extraction of the metal clamps used in the suture, formation of scar tissue, etc. For all these more than sufficient reasons, the author makes no use of bone suture in his practice in the Hospital Real de Santiago de Compostela, in Galicia, Spain. The enormous number of cases observed in the war has served to confirm these views as well as to modify other ideas as to the behavior of the surgeon in cases of fracture of the lower jaw; in favor of more conservative methods, with preservation of the bone-fragments and removal of necrotic parts exclusively. In cases associated with an extensive loss of substance, an immediate prosthesis should be applied, with the object of preventing the formation of cicatricial contractures and deformities difficult to correct. As regards the points of fixation of the prosthetic appliances, in this group of cases, the author utilizes all available teeth, on the principle of fixation in movable bridge work.

**Oral Surgical Cases in Practice.** S. L. Silverman. *The Dental Cosmos*, 1919, lxi, No. 10, p. 942.

The first observation concerned a man 42 years of age with an impacted lower third molar lying directly under the second molar. According to the author's maxim that all impacted teeth should be removed, whether or not obvious causative factors in local or constitutional disturbances, the third molar was removed, as well as the second which was undermined by a suppurative and destructive process. Recovery was uneventful, and the general nervous symptoms from which the patient had suffered for a few years past, were greatly relieved by the intervention. An accompanying figure shows the case several months later, with osseous reconstruction to a degree that insures more strength at this point of the mandible than it would have had even had the third molar remained in a healthy state. Another illustration shows the excellent results obtained in a case of single hare-lip in an infant, by means of the Owen operation, where only a single flap is used.

Actual wiring of the bone itself is advocated by the author as the only efficient procedure for the reduction and correction of fractures of the jaws, in those cases where no teeth or only a few teeth are present. In a fracture coming under this description in a negro of 47 years with an insufficient number of occluding teeth suitable for the application of an intra-oral appliance, an incision was made along the lower border of the mandible, the bone bared, and the wire inserted through the two holes, made sufficiently distant from the line of fracture

to insure healing. An illustration shows the case radiographed exactly two years after the operation, with favorable results too obvious for descriptive comment. The patient is totally unconscious of having any foreign object in his jaw, nor can any callus or wire be felt by palpating lingually and buccally. It is noteworthy that although the jaw is in perfect condition, the silver wire has broken into three pieces, as shown in another illustration.

**Reconstruction Work in War Injuries of the Face and Jaw.** Ivy, Eby, and Bodine. *Journal American Medical Association*, 1919, lxxiii, No. 18, p. 1337.

The successful treatment of maxillo facial injuries is known to depend on team work between the surgeon, the dental surgeon, and the dental prosthetist. The authors outline the practical application of this cooperation at the Walter Reed General Hospital where patients arriving from overseas are treated. In every case a thorough survey of the mouth is made, clinically and roentgenographically, to eliminate any factors capable of keeping up infection. All teeth in or near the fracture lines are extracted, bone cavities are drained, sequestra and foreign bodies are recovered. The splints employed in fixation of fractures are as simple as the nature of the case will permit. For many of the uncomplicated cases with many teeth and good occlusion, in which maintenance of reduction is easy, intermaxillary wiring of the teeth has proved efficient. For the majority of cases, the cast silver cap splint is employed. When there are firm teeth on both sides of the fracture it may be necessary to splint only the lower jaw, thus permitting mastication. For other cases the upper and lower teeth are splinted separately, the two splints being locked together in occlusion with a removable bolt on each side.

Two months of bone-grafting have been employed, in the form of Cole's method and the osteoperiosteal method of Delageniere, most of the cases proving unsuitable for Cole's method on account of being too extensive or situated at or behind the angle. Primary union followed the operation in all cases except one, in which it is hoped that union will still occur.

**Etiology and Treatment of Pyorrhea Alveolaris-Stomatitis Ulcerosa Chronica.** F. Forchheimer. *Practical Medicine*, Delhi, August, 1919, xvii, No. 8, p. 148.

As regards the pathology of this condition, the author points out the existence of two forms, the first of which marks simply the beginning of the disease and is limited to the gums at first finally involving the alveolar dental membrane and the periosteum, and therefore the alveolar process. An additional infection by pus producers results in the second form, or true pyorrhea alveolaris, the more common form of the disease. The process is originally a necrobiotic one, and therefore an ulceration, to which there is added a secondary suppuration, so that the term "Stomatitis ulcerosa" would seem to be the most appropriate term for this chronic affection. While the clinical course of chronic ulcerative stomatitis or "pyorrhea alveolaris," is somewhat different in children from what it is in adults, and while the etiologic factors are to a certain extent different, yet upon the whole the mechanism of production of this disease remains the same

in both classes of patients. The essential etiologic factor in the first process, referred to above, is a something that is eliminated from the general circulation by means of the mouth; secondarily, it is necessary to assume an infection with pus producers. The substances eliminated in this way include, as inorganic substances, lead, mercury, phosphorus; the organic substances are represented by certain toxins, the toxin of measles, for example, the toxins of a large number of the acute infectious diseases, possibly the ptomaines, as found in scurvy; finally, all the alloxuric substances which ultimately lead to the formation of uric acid. Although capable of producing by themselves the first form of chronic ulcerative stomatitis, these various substances presumably require the assistance of pus producers for the development of the second form or true pyorrhea alveolaris.

Concerning the treatment of this disease, the author emphasizes that every one of these patients should be treated both by the dentist and by the physician, the dentist impressing upon his patient the necessity for prophylaxis; and, when the disease has developed, treating the oral condition locally. The necessity for prophylaxis exists, first in the removal of all substances that irritate; and secondly, in applying methods calculated to carry out rational antisepsis of the mouth. As a matter of fact, the local treatment of the disease must be carried out on the same lines; and it is a great gratification to note to what extent and how skilfully and intelligently the American dentist carries out these indications. General treatment undoubtedly has its value and must be based on the removal of the toxic substances from the blood. The cases of chronic ulcerative stomatitis due to syphilis are notoriously the worst to handle; treatment by iodides, plus a general tonic course, will be found very valuable. Eliminative treatment for the control of chronic intoxications of all kinds consists in taking advantage of increased physiologic activity of the bowels, the kidneys, the skin, and even the respiratory apparatus.

**The Course and Prevention of Dental Caries. G. E. Clemons. The Medical Journal of Australia, 1919, ii, No. 13, p. 257.**

The subject of the cause and prevention of dental caries has occupied the serious attention of many workers, both medical and dental. The type of food as the main cause of decay in teeth has been discussed by a number of investigators, with special reference to its hardness or softness, the consequent improvement in the circulation and development of the jaws and teeth, and their effect in the production of acids and toxins by bacterial decomposition. Without wishing to underrate these factors, the author considers as a more important fact his repeated observation of signs of malnutrition in infants' teeth when, and as soon as they erupt. The malnutrition of these deciduous teeth is obviously due to some defect in the mother's blood, or the mother's milk or both. This problem is probably solved by recent laboratory experimentation along the line of accessory food factors and the vitamine content of various kinds of foods. Sufficient information as to the relative value of foods is now available to enable us to supplement children's and mothers' diets with the necessary vitamins. In order to supply her offspring after the first period of her pregnancy, the mother must have an adequate supply of them both during gestation and lactation. Vitamins should be added to the infant's diet, particularly for artificially fed babies; grow-



ing children need them as well. Food substances known to contain these vitamins are milk, meat, malt, yeast, codliver oil, etc. The combination of malt and oil for growing children suggests itself, and the author knows of children who have taken this for other purposes and have remarkably good teeth. A child's diet is most likely to be deficient in fat soluble vitamins from infancy to its second year, particularly bottle-fed babies who are given cow's milk diluted and rarely compensated for by the addition of cream. The diet of Maoris and Eskimos, who have by far the best teeth of all humans, apparently contains large amounts of fat soluble vitamins.

**Trifacial Neuralgia Produced by Root in Maxillary Sinus.** M. H. Feldman. *The Dental Digest*, 1919, xxv, No. 10, p. 583.

The author reports a peculiar case concerning a woman of 48 years who on account of severe nervous disturbances was about to be committed to a psychopathic institution. The teeth posteriorly to the right upper cuspid had been extracted many years ago, prior to the onset of the neuralgic affection in the right side of the face. Plate and film radiograms were taken and revealed a condition of empyema of the maxillary sinus, produced by the presence in the sinus of a portion of root apex of a molar. Operation was promptly resorted to, and the author removed three drams of pus and much necrotic tissue. The sinus was sutured immediately. At the time of this report this patient (who had been treated by neurologists for nervous trouble, with little relief) was enjoying perfect comfort and stability of the nervous system.

**Is Pyorrhea Curable?** H. Blackford. *Medical Sentinel*, 1919, xxvii, No. 10, p. 1090.

The nonamenability of pyorrhea to local treatment points to the existence of other contributory factors outside of infection in the etiology of this disease. The blood of these patients has lost its power of resistance through changes interfering with its oxidation and alkalinity. A very conspicuous part in reducing the oxidizing power of the blood is played by excessive carbon dioxide contents in the blood through faulty digestion; and pyorrhea is of rather common occurrence in patients whose blood is in such a condition. A considerable number of patients under the author's observation were treated for pyorrhea for varying lengths of time without any apparent results, until constitutional derangements responsible for the excess of carbon dioxide in their blood were corrected. In another group of cases, pyorrhea of a severe type is brought about through an acid condition of the blood, the result of a faulty diet. Accordingly, pyorrhea is not a mere local infection, but is a local manifestation of a constitutional disorder. The causes of pyorrhea are direct and indirect. A reduction in the oxidizing power of the blood through the absorption of various poisons, especially carbon dioxide, and an acid condition of the blood, are indirectly responsible for local chronic ulcerative changes, of which pyorrhea is a good example. Provided constitutional derangements, the predisposing causes of pyorrhea, are removed, this disease is eminently curable. An intelligent explanation to the patient as to the cause of pyorrhea would materially assist the dentist in the management of the treatment.

A complete history as to the patient's mode of living, habits, and various constitutional disorders should be taken by the dentist before he begins to treat him. The final word is: pyorrhea can be cured, but only by those who have an understanding of the causes of it.

**Treatment of Diseased Teeth.** J. M. Green. *Texas Dental Journal*, 1919, xxxvii, No. 10, p. 3.

The efficient control of pain (odontalgia) requires in the first place the discovery of the cause of the pain, the relief of which is usually a simple matter. Most pains about the teeth are undoubtedly due to the inflamed pulp following tooth decay, but aside from carious conditions, pain in and around the jaws may be caused by pulp nodules, enlargements of the roots (exostosis), fractured or impacted teeth, too rapid movement of the teeth for separation, or in orthodontia treatment. In dealing with a throbbing or aching tooth, the dentist should always aim at maintaining the vitality of the pulp and restoring the tooth to usefulness. In hopeless cases of pulp congestion, rupture or puncture of the pulp tissue will afford the best means of relief, followed by the application of a soothing dressing or by devitalization and removal of the pulp. If infiltrative or conductive anesthesia is to be used in connection with destruction of the pulp, it is not advisable to puncture the pulp, as this usually causes severe pain, which will be avoided after anesthesia is produced. In the presence of a dead pulp and putrescent canals, the tooth should be opened into almost to the point of exposure, with the rubber dam in place. When the pulp chamber is almost reached, the burr should be withdrawn and the cavity be flooded with phenol, tricresol, or other powerful disinfectant. As soon as the pulp chamber is opened, the atmospheric pressure carries the disinfecting agent into the canal, with the result that the growth of the bacteria is immediately checked. This disinfection, with instrumental evacuation of the canals should be repeated, until at the third sitting, when conditions permit, the canals may be thoroughly cleansed and then filled, after having been enlarged to the required size. The author recommends an application of ammonium silver nitrate solution, precipitated with formalin, by a combination rotary and pumping motion, using great caution that none of the solution is carried past the apex of the tooth, if at all avoidable. Blind abscesses are treated in approximately the same way, except that provision is made for drainage before filling. Fistulous openings are cured by forcing first a saline solution, then phenol, through the entire tract.

**Focal Infection.** F. G. Connell. *Wisconsin Medical Journal*, 1919, xviii, No. 5, p. 157.

The author points out that focal infection has been looked at, as many other subjects have been during the last decade, from an ever specialized viewpoint. A focus of infection is a localized septic condition, a suppurative process, with or without local manifestations; that is, a primary source of secondary systemic intoxications or microbic metastases. It is not necessary for the production of systemic or remote effects for bacteria to be disseminated from a localized infection; their toxins may be absorbed and the resultant toxemia may exercise a

deleterious influence either upon the general system or upon special tissues or organs. Teeth the source of infection and bridge work and crowns that retain infectious material must be cleaned up or removed. Consultation and team work between the dentist and physician each benefiting from the other's special knowledge is most desirable. The recognition of dental infection may be easy if apparent, and should be corrected on general principles with or without secondary symptoms of focal infection. In the presence of symptoms indicating a focus of infection somewhere in the body, the teeth among other possible causes must be suspected, and it is then that the x-ray is invaluable, especially in the blind abscesses or dental granulomas following devitalization of teeth. While a most valuable adjunct in the diagnosis of peridental infections, the dental roentgenogram calls for a proper interpretation, and the author admits that he finds great difficulty in reading these pictures. The treatment of focal infections must be both local and general, but the fundamental principle is a thorough removal of the primary focus. It is the symptomless tooth with a dental granuloma or blind abscess, devitalized teeth, dentistried teeth with imperfect root canal fillings, that are many times the original focus for secondary infections. Recognition and management of this class of pathologic conditions of the mouth require special study and an educated technic.

**The Teeth of Mankind.** Editorial. *New York Medical Journal*, 1919, cx, No. 12, p. 508.

Although the art of dentistry was never so highly developed as at the present day, the teeth of mankind, judging from medical history, were never in such bad condition as now. Comparison with the remote past is especially discouraging in this respect. "Altogether we have some hundreds of skulls from the New Stone Age, that is, of men who used polished and rather well finished stone implements and who lived at least some six or seven thousand years ago. In all these hundreds of skulls there is not a carious tooth to be found. Numbers of these have the enamel worn manifestly by hard chewing, but their healthy dentine had responded well to the pressure exerted on it and had hardened into a resistive vitality that thoroughly protected them. A rather similar state of affairs is found among the Egyptian bodies. None of the children's skulls show any caries of the teeth, though that is to be found among the adults, and it goes without saying that the Egyptian children present much better teeth than the children of our time. It is extremely rare to have to look into the mouth of a child without finding that its first or milk teeth are carious in many places, and sometimes most of them are sadly decayed. Manifestly the trouble is with the habits of mankind in the matter of chewing. Tooth decay has reached such a climax of destructiveness and danger to other structures in the body that it is time to be ready to review the whole subject of the care of the teeth apart from prejudice and customs so as to initiate a movement that will serve to save the teeth of the next generation at least."

A rearrangement of the modern soft and predigested bill of fare, so as to include certain good old-fashioned foods, hard to chew and therefore contributing to the vitality of the gums and purity of the teeth, is recommended as an important step in the right direction.

**The Possible Relationship of Dental Abscesses and the Toxemias of Pregnancy.** F. M. Loomis. *California State Journal of Medicine*, 1919, xvii, No. 11, p. 1919.

Chronic dental sepsis is advanced by the author as a possible etiologic factor in the toxemias of pregnancy, on the basis of the reasonable assumption that the irritation of chronic sepsis may be one of the determining factors in lowering the ability of the liver and the kidney to destroy or eliminate the toxins absorbed by the organism. In order to ascertain the frequency of dental abscess and the probabilities of absorption, Dr. W. R. Hughes, of Oakland, at the author's request examined the films of 125 devitalized teeth, with root canals filled, and found 103 abscesses clearly apparent. Dental authorities state that from 50 to 85 per cent of all devitalized teeth are infected. The possibilities for absorption in pyorrhea are evident when it is remembered that the average denture has a circumference of about 30 inches at the gum line. If the patient has pyorrhea with a line of only an eighth of an inch involved, there results an area of  $3\frac{3}{4}$  square inches of infected tissue, where most active absorption can occur. Direct and highly suggestive evidence of the part played by dental sepsis in pregnancy is not lacking, and eight illustrative cases are adduced by the author in support of his argument. On investigating the cases of hyperemesis, pre-eclamptic toxemia and eclampsia on his books, he found practically none without definite dental trouble; and these findings are confirmed by the experience of others. He now insists upon x-ray pictures of all devitalized teeth, and in the presence of definite abscesses has advised extraction in every month of pregnancy up to the ninth under local or general anesthesia, without as yet having had an acute increase of symptoms or a threatened termination of pregnancy. With an undoubted abscess present, he feels justified in the statement that there is less danger in having it out than having it in. However, he does not mean to say that a dental abscess is necessarily the cause of a toxemia just because it is present.

**Buccal Hygiene in Schools; Its Importance and Necessity.** P. Verissimo. *Revista Dental*, 1919, xii, No. 9-10, p. 266.

Upon the basis of personal investigations, the author (who is a member of the Faculty of Pharmacy and Odontology in Ceara, Brazil) advocates the establishment of a school dental service, to be maintained by the state. An institution of this kind would render most useful services to the children of the poor, and by improving their health would greatly assist the better development of the human society of the future. The bad results of deficient buccal hygiene are universally conceded by scientific investigators as well as by the governments of all highly civilized countries who have recognized the importance of buccal hygiene by the establishment of school dispensaries and clinics, accomplishing excellent results. Dental service in schools always proves of inestimable value, greatly superior to what would appear at first sight to those who are not trained along this line of observation. The treatment of carious teeth, and the extraction of incurable roots, are highly useful measures in the prevention of tuberculosis, by eliminating dangerous avenues of bacterial invasion and intoxication. The filling of carious teeth serves to remove the lodging places where the tubercle bacillus lives and flourishes,

while this treatment at the same time facilitates an efficient hygiene of the mouth. Accordingly, the practice of buccal hygiene at all ages, as accomplished through appropriate measures of treatment, the filling of carious teeth and the extraction of incurable teeth, constitutes anti-tuberculous prophylactic measures of inestimable value. Tuberculosis, bronchitis, and pneumonia are referable in certain cases to autoinfection of buccal origin, through transmission of the infectious discharges to the respiratory passages. General intoxications often have their point of entrance in the mouth, for the microorganisms of the mouth and their toxins may pass into the circulation, thereby giving rise to grave disturbances. Defective teeth prepare a favorable culture medium for the most dangerous microorganisms which penetrate with the air into the lungs, with the saliva into the stomach, and by way of the lymphatics into the organism. These affections occur especially in the young, because their still growing and delicate body does not offer a strong resistance against infectious diseases. Nowhere more than among school children is there this urgent need of measures of buccal hygiene, for their mouths are as a rule entirely neglected, so that these children become the carriers of microbes which in their turn give rise to contagious diseases, for example, diphtheria.

It is an established fact that children with carious teeth require six months more than the five years usually needed by pupils with healthy teeth for acquiring the knowledge taught in the schools. About forty per cent of the pupils who do not regularly attend school are absent on account of the bad condition of their teeth. In a school in which 190 boys were examined, 937 cavities were found, 450 of which concerned permanent teeth. Of these children, 50 had suffered from scarlet fever in a recent epidemic, and in their teeth, 238 cavities were found. A scarlet fever epidemic in Valparaiso, which lasted over two years, was finally controlled by rigorous dental inspection and care of the mouths of school children, the majority of cases having originated in the schools.

Proper care of the teeth should begin in early infancy and children will derive enormous benefit from instruction in the primary schools as to the maintenance of personal dental hygiene. The school is the suitable point of distribution of hygiene and prophylactic rules, and these lessons will protect the pupils against the constant and repeated toothaches which always leave an injurious and often greatly prolonged impression in the nervous system. A considerable number of cases of epilepsy have been attributed to a pathologic condition of the teeth, acting as a persistent source of irritation. In a general way, it may be said that disturbances of the nervous system are not uncommonly referable to neglected teeth.

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## EDITORIALS

### Unjust Criticisms of the Teaching of Orthodontics in Schools

NO phase of professional work ever reaches a point that is beyond criticism, neither does it ever attain such perfection that no fault can be found with it. This is true of the teaching of any subject. Criticisms to be of any value should be based upon a careful survey of facts, lest they become unfair. During the past two years it has become a custom among a number of orthodontists and writers to criticize the teaching of orthodontics in dental colleges and post-graduate schools upon every available opportunity. An analysis of these criticisms will show that most of them have been based upon Utopian ideals, which, at the present time, are not practical.

It is well to have ideals, but to be of any use, they must be founded upon conditions as they exist, or they will become as disastrous as the experiments

in government that have been attempted by socialists and other radicals. It seems rather strange that the majority of criticisms of the teaching of orthodontics in dental colleges has come from men who have had practically no experience along this line and who have made practically no investigations as to what is being taught and the conditions possible in dental schools for teaching along the lines they suggest.

One of the most noticeable points brought out by a number of critics is that too much time is given to orthodontics in the dental schools and not enough in the postgraduate schools. In other words, they would shorten the time devoted to the subject in dental schools, and increase that in the postgraduate schools. This seems very illogical. If a student is studying dentistry, why should he not receive certain instruction in orthodontics and thus save considerable time in postgraduate work? The majority of such suggestions come from men who received practically no instruction in orthodontics in dental schools and who spent only a short amount of time in postgraduate work. Many of them have been successful in practice, still they are advocating a course that they did not follow and that is very often entirely impracticable.

We have called attention before to the fact that the great mistake in medical and dental education today is that the courses are being extended over too great a period of time, which means that the student is older than he should be before he is able to enter his profession. Viewing the situation from an economical standpoint, he spends too many years of his life as a nonproducer, consequently becoming a liability to society for a number of years. If to this time a long period for postgraduate work is added, the student continues just that much longer to be a burden to society.

One of the most notable criticisms of the present method of teaching orthodontics was brought out in the presidential address delivered by Dr. B. Frank Gray before the Pacific Coast Society of Orthodontists and published in the August issue of the *JOURNAL*. The criticisms made by Dr. Gray are very similar to those that have been made for a number of years by men who have stated what they believed or thought to be true but have not made investigations to prove their statements.

Dr. Gray says: "I do not know that any special progress has been made in this department. I believe it is one of the unsolved problems." Of course, in making his claims that there has been no special progress in the teaching of orthodontics, he fails to state over how long a period his observations extend. However, as he states "the suggestions I heard Dr. Angle make a good many years ago are still fresh in mind," we are inclined to believe that his observation must be extending over "a good many years."

In his criticisms he also features certain possibilities as being the solution of the problem of teaching orthodontics, which cover to a certain extent, the visionary ideal, but he leaves out the most important phase of the subject; namely, a faculty with which to teach orthodontics. He calls attention to the possibilities of endowed institutions, but forgets that endowed institutions have probably been the biggest failures in education from every standpoint, because they often feature the endowment and lose sight of the fact that real teaching value in institutions

lies with the men behind the institution. It matters not how fine the building, or how large the endowment, unless there is a good faculty, the student will not learn much in either orthodontics, dentistry, medicine, or law. This is proved by the fact that the large state universities and endowed institutions are not turning out as large a percentage of competent students as are coming from the smaller colleges and private institutions that have faculties capable of turning out men with the ability to accomplish something in life. It would indeed be interesting to know whether Dr. Gray had made investigations of endowed institutions, in any kind of education and compared them with the efficiency of unendowed institutions, universities, and private schools as regards the efficiency of the graduates and those who have accomplished the best things in life. It would also be interesting to know whether he has investigated the postgraduate teaching of orthodontics as it exists at the present time compared with the course he took a good many years ago. From knowledge that we have of the postgraduate situation, we are quite sure that Dr. Gray has not taken advantage of several opportunities to investigate and compare the postgraduate teaching of orthodontics today and a few years ago. We know he neglected to investigate conditions in certain undergraduate schools where special attention is being given to the subject.

It is indeed unfair for any man to make the statement that he does not know of any progress in the teaching of the subject when he has failed to investigate at least a few schools where advances have been and are being made. We know that teachers will invite improved methods, but we contend that improvement certainly has been made over "a good many years ago."

We are also unwilling to admit that the subject *has not been taught* in dental schools and only *attempts* made at teaching it, as one would judge from Dr. Gray's address in which he states: "With all due respects to those who have *attempted* teaching the subject in dental schools, it has so far been a laborious, unsatisfactory proposition." A number of instructors *have taught*, and not only *attempted* to teach it. In a number of schools it has *not* been a laborious unsatisfactory proposition.

Dr. Gray has not taken advantage of the opportunities afforded to investigate this matter, for we know that for a number of years the dental department of the College of Physicians and Surgeons of San Francisco, in which city Dr. Gray is now located, has given postgraduate instruction every year to a number of students. During the time the last course was being given Dr. Gray was invited to visit the institution to familiarize himself with what is being taught at the present time as compared with what was being taught a good many years ago. He did not accept this invitation; still he takes it upon himself to make the statement that *no improvement* has been made. We are calling attention to instruction given in this school especially because it would have been so easy for Dr. Gray to have collected data before he made the unjust criticism which he did make in his presidential address. It would have been very easy if he was going to set himself up as a critic to examine postgraduate instruction as given in other schools in different parts of the country. We would further suggest that he visit such dental schools as St. Louis University, University of Iowa,



Vanderbilt University, and a number of other schools, before he makes such statements.

We do not pretend that the teaching of orthodontics has advanced to the point of being beyond criticism, but we do object to criticism being made by men prominent in society work in such a manner as to be an insult to every teacher of orthodontics in dental colleges today. Criticism is a good thing for any subject, but it must be based on facts and not on false ideas if it is to have any value.

## **ORTHODONTIC NEWS AND NOTES**

The editors desire to make this department a permanent feature of the Journal, but in order to do so must have the full support of the orthodontic profession throughout the country. We would deem it a great favor if our subscribers and readers would send in such announcements as might be of interest to the profession.

Harvey A. Stryker, D.D.S., 317 Cutler Building, Rochester, N. Y., has sent an announcement that his practice will be limited to orthodontia exclusively after the first of January, 1920.

Dr. J. F. McDonald announces the opening of offices for the exclusive practice of orthodontia at Birmingham, Alabama. His offices are in the Empire Building.

Landis H. Wirt, D.D.S., announces the opening of his offices for the practice of orthodontia at 311 Union Trust Building, South Bend, Indiana.

Dr. W. B. Childs announces his location at 706 Candler Building, Atlanta, Georgia, for the exclusive practice of orthodontia.

Dr. Irving Spenadel, 317 East 10th Street, New York City, announces that he will limit his practice to orthodontia exclusively.

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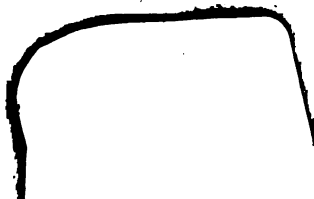








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